VIRONMENTAL IMPACT STATEMENT
For

LYE CREEK DRAIN WATERSHED

Montgomery County, Indiana

A LOCALLY INITIATED PROJECT
WITH FEDERAL ASSISTANCE THROUGH P.L. 566
83rd Congress, 68 Stat. 666 as amended

U. S. Department of Agriculture
Soil Conservation Service

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Lye Creek Drain Watershed
Montgomery County, Indiana

FINAL ENVIRONMENTAL IMPACT STATEMENT

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Sponsoring Local Organizations:

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March 1975

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USDA ENVIRONMENTAL IMPACT STATEMENT

Lye Creek Drain Watershed Project

Montgomery County

Indiana

Prepared in Accordance with
Sec. 102(2) (C) of P.L. 91-190

II. SUMMARY SHEET[1/]

A. Final

B. Soil Conservation Service

C. Administrative

D. Description of action: A project for watershed protection, flood prevention, and drainage in Montgomery County, Indiana, to be implemented under authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Stat. 666) as amended. Approximately 11.3 miles of channels will be widened, deepened and cleared for flood prevention and drainage. One-side construction will be performed.

E. Summary of environmental impacts: Adequately treat 10,706 acres (82 percent of the watershed). Reduce soil loss on 2,431 acres and improve channel bank stability, thus reducing erosion and sedimentation by 41 percent. Provide joint floodwater and drainage relief to 3,320 acres and reduce damages by 84 percent. Improve wildlife habitat by vegetative land treatment measures. Increase forest land by 12 acres and afford management to 68 acres of forest land. Protect 8 acres of woody habitat and 13 acres of idle land within the permanent easement area for the channels. Establish 21 acres of trees and shrubs and 6 fishery pools with deflectors on the disturbed areas adjacent to and in the channel. Improve the quality of life and increase demands on area business.

Loss of 154 acres of grassland and 137 acres of idle land presently used as wildlife habitat to cropland. Cause temporary damage to the stream fishery of the lower one mile of Lye Creek Drain. Destroy 15 acres of woody habitat as a result of channel work. Increase noise, air, and water pollution (turbidity) during construction.

1/ All information and data, except when otherwise noted by reference to source, were collected during watershed planning activities by the Soil Conservation Service, U.S. Department of Agriculture.

II. SUMMARY SHEET - CONT'D

F. List of alternatives considered: (1) conservation land treatment only, (2) pump drainage and channel work, (3) nonstructural measures and channel work, (4) no PL-566 project--no local action.

G. Agencies from which written comments were received for the draft statement:

Department of the Army
Department of Health Education and Welfare
Department of the Interior
Department of Transportation
Environmental Protection Agency
Advisory Council of Historic Preservation
Indiana Department of Natural Resources (for Governor)
Indiana State Historic Preservation Officer
Ohio River Basin Commission
National Audubon Society

H. The draft statement was transmitted to CEQ on September 16, 1974.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

USDA SOIL CONSERVATION SERVICE
FINAL ENVIRONMENTAL IMPACT STATEMENT
for
Lye Creek Drain Watershed, Montgomery County, Indiana

A. Authority: Installation of this project constitutes an administrative action. Federal assistance will be provided under authority of Public Law 566, 83d Congress, 68 Stat. 666 as amended.

B. Sponsoring local organizations: Montgomery County Soil and Water Conservation District, and the Montgomery County Drainage Board.

C. Project purposes

1. Watershed protection (conservation land treatment)

The soil and water conservation district will encourage landowners to install good vegetative treatment and improve farming methods for erosion and water runoff control. Their goal is to have at least 10,706 acres (82 percent) of the watershed area adequately treated by the end of the project installation period. One effect of adequate land treatment will be to reduce soil loss on eroding cropland from approximately 5.7 to 3.2 tons per acre per year. This is below the tolerable limit of 3.5 tons per acre per year consistent with sustained agricultural production.

2. Flood Prevention

The primary objective of landowners along the major channels is to reduce the flooding to acceptable levels consistent with present cropland (Appendix B).

The acres being flooded at present are:

Frequency	1 yr.	5 yr.	10 yr.	50 yr.
Reach A	34	167	207	296
Reach B	110	334	431	710
Reach C	0	27	45	72
Reach D	156	169	176	183

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

C. Project purposes

3. Drainage

Another goal of the sponsors is to provide for the safe and timely removal of excess water from flood plain and depressional areas. Subsurface water removal for all areas in need is also desired as part of project works of improvement. Removal of excess water within a 24-hour period is the general goal of the sponsors. Areas affected by reach are: A-1,540 acres; B-1,110 acres; C-760 acres. Excess water damages the crops for four to six days at the present level of drainage.

D. Planned project

1. Land treatment measures

The application of soil and water conservation practices will reduce soil loss from erosion, promote the proper use of soil and water resources, and provide lower maintenance costs for the planned structural measures.

The land treatment measures to be installed during the project installation period include conservation practices on 4,545 acres of cropland, 243 acres of pasture, and 68 acres of forest land. Adequate land treatment will be achieved on 5,072 acres or 39 percent of the total watershed during the four-year installation period.

Conservation practices to be applied on cropland include contour farming, grassed waterway or outlet, minimum tillage, crop residue use, grade stabilization structure, subsurface drain, and drainage main or lateral.1/ A combination of two or more practices is often needed to achieve adequate treatment of land. Land treatment practices such as waterways, diversion, pasture planting and management, tree planting, critical area planting and rotation from grazing will benefit wildlife. Forestation planting, forest land treatment and forest protection will not only provide enhanced soil protection, but these practices will also benefit the forest based economy of the surrounding area. The Soil Conservation Service Technical Guide will be used in planning alternatives for adequate land treatment.

Pasture land treatment measures to be installed include pasture and hayland planting and pasture and hayland management.

1/ See appendix A-1 for definition of practices.

D. Planned project

1. Land treatment measures - cont'd

Forest land treatment measures to be installed are tree planting on open land, where necessary to control erosion, establish windbreaks and adjust land capability throughout the watershed. Adapted species for planting will be recommended by the Indiana Department of Natural Resources (IDNR), Division of Forestry in cooperation with the U.S. Forest Service. Hydrologic conditions by manipulation of stand composition, protection from grazing, and developing management plans will be improved. The multiple-use forest land treatment program was cooperatively developed by the IDNR, Division of Forestry and the U.S. Forest Service.

The sponsors estimate that 15 additional landowners or operators will become cooperators with the soil and water conservation district and develop conservation plans during the project installation period.

A soil survey was published for Montgomery County in 1912, however, much of this data is now obsolete and in need of revision. At present, modern soil survey has been completed on 6,000 acres in the watershed. Plans are to complete an additional 5,000 acres in the watershed during the next four years.

The SCS will provide the needed technical assistance for soil surveys, conservation planning and application of conservation practices. Land treatment will consist of voluntary actions taken by individual landowners or operators.

2. Structural measures

The structural measures included in the plan consist of approximately 11.3 miles of multiple purpose flood prevention and drainage channel work as shown on the project map (Appendix B). The existing channels are manmade or previously modified with remnants of spoil present along the total length.[1/] The channels have intermittent flow. Sediment deposition has reduced the capacity of the channels and tile outlets. Woody vegetation is also restricting flow in most of the channels. A narrow band of trees and woody vegetation separates the channel from cropland. A small wooded tract borders the channel on the north side upstream of the outlet in Reach B. The last downstream mile of Lye Creek Drain has been identified as a fish spawning area.

The channel work will deepen the existing channel for drainage and also widen it where additional capacity is required. Channel work is planned to follow existing alignment. Excavation will be done from one side to reduce damage to wildlife habitat. Significant trees will be left standing on the construction side, if at all practicable (Appendix A-3). In isolated cases where slope protection is required on the opposite bank, work may be

1/ See Appendix A-11 for channel data.

done from both sides. All flow impeding brush and unstable or fallen trees will be removed from both banks. Armor plating (gravel blanket) will be used to protect unstable soils on the bottom and sides of the channel. Preliminary investigation indicates that armor plating will be needed in the following areas: Armentrout Tributary, station 1156+00 to 1150+00, station 1105+00 to 1115+00, station 1060+00 to 1070+00, and station 1046+00 to 1040+00; Rusk Ditch, station 923+00 to 909+50 and station 8+50 to 8+60; Main channel, station 1025+00 to 985+00, station 959+24 to 965+00, and station 903+00 to 847+00. The berm will be used as a maintenance travelway. A 15 foot vegetated buffer strip will be maintained on the unconstructed side to protect the channel from farming operations and also serve as a travel lane for wildlife.

Fence will be installed where there is potential for livestock using the area adjacent to the channel. Markers will be used to delineate the boundaries of wildlife plantings and vegetative buffer strips (See Appendix A-4). Openings will be left in the spoil to avoid induced stages on the unconstruction side. Appurtenances are planned for all reaches to safely lower surface water into the channels.

Work, as necessary, will take place on the unconstructed side to install appurtenances. Care will be taken to minimize the disturbance of wildlife habitat.

Work will be limited between stations 903+00 and 959+24 to removal of debris. The work will not affect the stability of the channel.

An existing continuous spoil bank on the south side of Lye Creek Drain and the west side of Durham Ditch will be repaired to give additional protection to the muck area that is presently being pumped for drainage.

An interdisciplinary team comprised of representatives from the Indiana Department of Natural Resources, U.S. Fish and Wildlife Service, landowners and sponsors, and the SCS will participate in the development of design plans and specifications and operations and maintenance procedures. These cooperatively developed plans and specifications will be adhered to unless determined inappropriate during construction; however, all members of the team will be provided the opportunity to develop the necessary revisions.

Care will be exercised to minimize the amount of construction sediment. Sediment traps will be installed as needed. Cleared material will be buried or disposed of by other acceptable means determined by the interdisciplinary team.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

D. Planned project

2. Structural measures - cont'd

Land rights will consist of approximately 124 acres of permanent easements and 124 acres of temporary easements. The permanent easement area consists of approximately 30 acres of cropland, 22 acres of woody vegetation, 35 acres of channel area, and 37 acres of grassland. As a result of this project, the permanent easement area will consist of 43 acres of channel area, 23 acres of woody vegetation, and 58 acres of grassland. The temporary easement area will be in cropland. These areas will not be available to the public without the permission of the landowner.

Woody vegetation will be established and maintained within the permanent easement area to mitigate approximately 15 acres of woody wildlife habitat destroyed by the structural improvements. A strip of trees and shrubs approximately 15 feet in width will be planted within the permanent easement on the 21 acre spoil area. The vegetated buffer strip on the unconstructed side of the channel, within the permanent easement, will include eight acres of existing woody material and 13 acres that can be utilized for wildlife habitat. Approximately 58 acres of grasses and legumes will be seeded on the disturbed areas within the permanent easement.

Construction will be on the south side of Lye Creek Drain below county road 450E. Fast growing species of trees will be planted to provide shade for the fishery. Six fish pools will be installed in this reach to mitigate the construction damage to fisheries. Deflectors will be placed at the upstream end of each pool to maintain depth by concentrating the flow of water (Appendix A-5).

Condensed profiles of the planned channel work are attached as Appendix A-6.

A wide variety of materials will be encountered during construction because of the complexity of the geologic history of the area. A general description of materials, by reach, is tabulated below:

Lye Creek Drain - A

Station	847+00 to 903+00	1-3.5' of organic topsoil and muck over mostly till, but with some thin sandy outwash lenses.
	903+00 to 959+24	1.5-4.5' of muck over mostly till, but with some thin sandy outwash lenses.

D. Planned project

2. Structural measures - cont'd

Lye Creek Drain - B	
Station 959+24 to 1036+18	1.5-2.5' of organic topsoil and muck over mostly till, but with some thin sandy outwash lenses.
1036+18 to 1098+00	1.5-3.0' of muck over mostly till, but with some thin sandy outwash lenses.
1098+00 to 1158+00	1.5-6.5' of muck over variable till and sandy outwash.
1158+00 to 1172+00	1.0-2.0' of organic topsoil and muck over variable till and sandy outwash.
Rusk Ditch - A	
Station 826+30 to 909+50	1.0-6.0' of organic topsoil and muck over variable till and sandy outwash.
909+50 to 923+00	2.0' of muck over variable till and sandy outwash.
Durham Ditch - B	
Station 1017+50 to 1077+00	2.0-6.5' of muck and lacustrine clay over till, no outwash.
Armentrout Tributary - C	Up to 6.1' of organic topsoil and muck over till, no outwash.

The channel work data is displayed in Appendix A-11.

3. Operations and maintenance

a. Land treatment measures

The land treatment measures will be operated and maintained by the owners and operators of the farms under agreement with the Montgomery County Soil and Water Conservation District. Technical assistance will be provided by the Soil Conservation Service.

Forest land treatment measures will be maintained by the landowners with technical assistance furnished by the Indiana Department of Natural Resources in cooperation with the U.S. Forest Service under the going Cooperative Forestry Program.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

D. Planned project

3. Operations and maintenance - cont'd

b. Structural measures

Operations and maintenance costs include all necessary expenditures after installation to realize the estimated benefits during the 100 year project evaluation period.

The Drainage Board will assume responsibility of the operations and maintenance of all structural measures including measures for fish and wildlife. This work will consist of such items as controlling adverse vegetative growth and removing debris and/or excavation of shoal deposits as required to reduce serious bank erosion and maintain the designed channel capacity. Markers or vegetation which have been damaged accidentally or deliberately will be replaced or protected by the project sponsors. Additional items may be: repair of critical areas by seeding, sodding, or placement of stone or riprap; repair or replacement of appurtenances; and protection of mitigation measures within the permanent easement areas. Operating agreements will include provisions as indicated in the revegetation and fish pool development plan. Total estimated operations and maintenance will cost $3,680 annually. Operations and maintenance activities will be conducted in a manner to minimize adverse environmental effects. State and federal agency restrictions or pesticides will be recognized when providing maintenance on project rights-of-way.

An "establishment period" is prescribed to allow time for latent defects to become apparent. The establishment period for structural works of improvement shall extend three years from the date that the structural works of improvement are accepted from the contractor as being completed. The establishment period for vegetative work associated with a structural measure is to terminate when any of the following conditions are met:

a. Adequate vegetative cover is obtained
b. Two growing seasons have elapsed after the initial installation of vegetative work.
c. The establishment period for the associated structural measure has terminated.

During the establishment period for vegetative measures, SCS may approve PL-566 cost-sharing for additional work required to obtain an adequate vegetative cover. Approval of SCS is also required for PL-566 cost-sharing for other repair or additional work on completed structural works of improvement. Requests for approval will be considered if:

a. The need is determined during the establishment period.

b. The need results from latent conditions unknown to both SCS and the sponsors or from misjudgments, deficiencies, or mistakes by SCS.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

D. Planned project

3. Operations and maintenance

b. Structural measures - cont'd

c. PL-566 cost-sharing requested for the repair of additional work does not exceed the ratio authorized for the original construction of the specific work involved.

d. Performance of the repair or additional work does not lessen or adversely affect the legal liability of the construction contractor or his surety to bear the cost of the work.

The SCS and the sponsors will make a joint inspection annually and after unusually severe floods, and after the occurrence of any unusual conditions that might adversely affect the structural measures. These inspections will continue for three years following installation of each structure. Inspections after the third year will be made annually by the sponsors. They will prepare a report and send a copy to the Service employee responsible for operations and maintenance inspections and follow-up. The IDNR will be informed of any scheduled inspection. A record of each inspection will be kept in the file of the sponsor and will be available for authorized inspection.

An operations and maintenance agreement, detailing the responsibilities of the sponsor and the Service regarding the establishment period and other items, will be executed prior to signing land rights or project agreements. The agreement will use as a basis the SCS State Watersheds Operations and Maintenance Handbook. An operations and maintenance plan will be prepared for each structural measure.

The Drainage Board will be responsible for operating and maintaining the structural measures. They have the authority to finance this work by either taxation or special assessment. They will assess the landowners annually for operations and maintenance until an amount equal to four times the estimated annual amount for operations and maintenance is attained. They will then discontinue to levy until the fund is depleted. The process will then be repeated.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

D. Planned project

4. Project costs

The total installation cost is estimated at $526,540 of which $324,230 is PL-566 cost and $202,310 is Other cost. Construction cost of structural measures is $356,100 of which $242,150 is PL-566 cost and $113,950 is Other cost.

E. Environmental setting

1. Physical resources

Lye Creek Drain Watershed contains 20.37 square miles (13,035 acres) of northeastern Montgomery County in west-central Indiana. Relative locations of some important cities follow: Danville, Illinois 42 miles west; Lafayette, 18 miles north; Crawfordsville, 9 miles southwest; Frankfort, 19 miles northeast; and Indianapolis, 44 miles southeast.

The watershed is not within any Standard Metropolitan Statistical Area (SMSA). The 1970 census showed Montgomery County to have a population of 33,930. Except for Crawfordsville, a city of 13,842, the county is classed as rural (59.2 percent). There are no built-up areas within the watershed; however, two small towns lie near the boundary: Linden, 1 mile northwest (population 713), and Darlington, 2 miles southeast, (population 802). Population of the watershed is estimated at 275.[1/]

Present land use within the watershed is as follows: cropland, 87 percent (11,315 acres); forest land, one percent (129 acres); pasture, 7 percent (891 acres); and other, 5 percent (700 acres).

A high level of agricultural production may be sustained even though a certain amount of soil is lost each year to erosion. The tolerable limit of soil loss is being exceeded on 2,431 acres of cropland scattered throughout the watershed. An additional 8,082 acres of cropland is

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1/ 1970 Census of Population, Advance Report, PC (VI) - 16, Indiana: U. S. Department of Commerce, Bureau of the Census, December, 1970.

on mineral soils having a wetness limitation for crop production. Crops are grown on 802 acres of muck soils with a wetness limitation in the southwestern part of the watershed.

A total of 1,330 acres are subject to overbank flooding; an average of 960 acres is affected annually. Nearly 3,320 acres have joint, inseparable, flooding and drainage problems.

Sediment has accumulated in the one mile section of Lye Creek Drain above Lye Creek.

The climate within the watershed is typical of the region. Average annual precipitation is about 39.5 inches. Distribution is nearly cyclic, ranging from a low monthly average of 2.16 inches in February to a high of 4.74 inches in June. Fifty percent of the precipitation falls in the growing season, often as high intensity rainfall. Snowfall varies considerably from year to year, but averages 22 inches, with 5-6 inches each month from December through February.

Average daily maximum temperatures range from a low of 37° F in January to a high of 87° F in July. Average daily minimums range from a low of 23° F in January to a high of 65° F in July. Average daily temperature ranges from 29.7° F in January to 76.3° F in July. An average of 35 days per year have a maximum temperature over 90° F and the temperature falls below freezing an average of 120 days. The growing (frost-free) season averages 170 days. Average annual sunshine is 2,700 hours. There are usually 45 days a year with thunderstorms.[1 & 2/]

The watershed is within National Land Resource Area (NLRA) 111, the Indiana and Ohio Till Plain.[3/] In Indiana this area is called the Tipton Till Plain and is the largest physiographic region in the state. Typically the region is very flat to gently rolling and has undergone little post-glacial modification by streams.[4/]

1/ Annual Summary, Climatological Data Indiana: U.S. Department of Commerce, NOAA, EDS, Vol. 76, November 13, 1971.

2/ The National Atlas of the United States of America: U.S. Department of Interior, USGS, 1970.

3/ National and State Land Resource Areas Map, USDA, SCS.

4/ Thickness of Drift and Bedrock Physiography of Indiana North of the Wisconsin Glacial Boundary: William J. Wayne, Indiana Geological Survey Report of Progress #7, 1956.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

E. Environmental setting

1. Physical resources - cont'd

Elevations within the watershed range from 835 feet above mean sea level at the extreme eastern boundary to 745 feet at the downstream end of Lye Creek, giving a total relief of 90 feet. Local relief is usually slight but may approach 45 feet on some kames and eskers and along Lye Creek. The major part of the watershed is flat or very gently sloping.

The General Soils Map shows seven soil associations. A soil association is a landscape that has a distinctive proportional pattern of soils. It consists of two or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

The table "Estimated Soil Limitations or Suitabilities for Selected Uses" is to be used in conjunction with the General Soils Map. The table lists the percentage of each soil association, the percentage of soils in each soil association, and the limitations and suitabilities of the major soils for specific land uses.

The General Soils Map, limitation table, and soil association descriptions are found in Appendix A-7.[1/]

The landscape in the watershed is a consequence of Pleistocene glaciation of Wisconsin age. See Appendix A-8, General Surficial Geology Map, which pertains to the following discussion.

A complex group of end moraines deposited during a readvance of the glacial front exists around Crawfordsville, southwest of the watershed. Part of one of these end moraines is found in the south-central part of the watershed. As the glacier retreated, meltwaters deposited sand and gravel outwash in front of the ice margin. The presence of the end moraines to the southwest prevented drainage of the meltwaters and created a small lake, since drained, and now represented by the area called "mucks". Some small kames and eskers also developed during the glacial retreat. Lye Creek breached the end moraine and has, over time, developed some alluvial materials in its flood plain.

1/ Montgomery County General Soils Map, Purdue U. and SCS, Nov. 1971.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

E. Environmental setting

1. Physical resources - cont'd

Glacial drift thickness ranges from zero at the extreme downstream part of Lye Creek to over 250 feet at the northwestern watershed boundary. The area is underlain by the Norman Upland, a physiographic unit that developed on erosion resistant sandstones and siltstones of the upper part of the Borden Series of Mississippian age.1/

Mineral resources are scarce. There are no metals, mineral fuels (coal, oil, or gas), or industrial minerals being mined or produced in the watershed. The muck area in the southwestern part of the watershed has limited marl and peat deposits. Some sand and gravel can be found in the scattered areas of glacial outwash and stratified drift. Neither of these resources is being commercially utilized.

Lye Creek Drain Watershed is located in the central part of the Wabash River (excluding White and Patoka Rivers) Subregion (0513) of the Ohio River Water Resource Region and is considered physically similar to the rest of the subregion.2/

There are no known areas of wetland types 3, 4 or 5 in the watershed.3/ The central part of Rusk Ditch has 28 acres that receive annual flooding, and Durham Ditch about 155 acres. These areas classify as Type 1 wetland, but 80percent of the area is presently in cropland. The remainder is grassland and other land. There are also a number of small Type 1 wetlands in the wooded flood plain along Lye Creek.

Eight ponds occur in the watershed. They have a total surface area of about five acres. The largest is the two acre pond owned by the Linden Conservation Club. All ditches and drains are intermittent (continuous flow through some seasons but little or none through others) and manmade or modified.

Rusk Ditch, approximately two miles in length, drains about 1,745 acres of the northwestern part of the watershed. It flows in a southerly direction and joins Lye Creek Drain in section 22. Rusk Ditch beginning at Road 1000N has a bottom width of 30 feet with side slopes of 2 to 1, but lacks depth to outlet the tile from the north. Downstream about 1000 feet the bottom width is 13 feet with the same side slopes, and a narrowing channel. Further downstream the channel becomes shallow and parabolic shaped with 2 to 1 side slopes but lacks depth for tile drainage. This type channel continues through Road 900N and then gradually becomes entrenched to the outlet.

1/ Thickness of Drift and Bedrock Physiography of Indiana North of the Wisconsin Glacial Boundary: William J. Wayne, Indiana Geological Survey Report of Progress #7, 1956.

2/ Water Resources Regions and Subregions for the National Assessment of Water and Related Land Resources: U. S. Water Resources Council, 1970.

3/ Wetlands of the United States: U.S. Department of the Interior, Fish and Wildlife Service, Circular 39, 1971.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

E. Environmental setting

1. Physical resources - cont'd

Durham Ditch, about a mile long, drains about 802 acres of muck in the southwestern part of the watershed. It flows northeasterly and joins Lye Creek in section 26. The channel beginning at Road 650N is parabolic shaped with 2 1/2 to 1 side slopes and contains spoil on the left for 2,800 feet.[1/] Approximately 1,500 feet downstream of the road the channel gains width but lacks depth. The channel then gradually narrows to 12 feet at the outlet where side slopes are 2 1/2 to 1.

Armentrout Tributary, a ditch about two miles long, drains about 1,790 acres of the northeastern part of the watershed. It flows south for about a mile, then turns to the southeast to join Lye Creek Drain just above its confluence with Lye Creek in section 30. The ditch, beginning at Road 900N is a constructed channel, parabolic in shape, with an average of 1 1/2 to 1 side slopes.

Lye Creek Drain starts in the north central part of the watershed and flows about two miles southwest. It then turns south for a half-mile, then southeast for a half-mile before flowing about three and one-quarter miles in a generally easterly direction to join Lye Creek. Its total drainage area is about 9,990 acres, or 21.7 percent of the total drainage area of Lye Creek at its junction with Lye Creek Drain. Beginning downstream of Road 800N the channel has a bottom width of 14 feet with 2 to 1 side slopes and is also the beginning of spoil on the right side. Approximately 3,000 feet further downstream the channel is vee shaped with a continuous spoil on the right side. Continuing on for 2,700 more feet, the channel approaches a parabolic shape with a rounded bottom of 16 feet with the same side slopes. The channel 200 feet further downstream has a 17 foot bottom width with the same side slopes, however, 2,500 feet downstream the side slopes change with one side being 2 to 1 and the other 1 to 1. At this point the channel begins to change shape by narrowing and becoming entrenched through Road 450E and is vee shaped with side slopes of 3 1/2 to 1 on the left and 2 1/2 to 1 on the right. Approximately 1,500 feet downstream of Road 450E and onto the outlet the channel is 16 feet in bottom width with side slopes of 1 to 1.

Armentrout Drain starts at the extreme eastern end of the watershed, and flows about two miles to the southwest before joining Lye Creek in section 31. It drains approximately 1,190 acres of the southeastern part of the watershed.

1/ Note: All directions (left or right side) are looking downstream.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

E. Environmental setting

1. Physical resources - cont'd

Lye Creek is a natural perennial stream that flows through the watershed in a generally south-southwesterly direction. About a two-mile reach is present in sections 30 and 31 in the south-central and southeastern part of the watershed.

There are no stream gages in the watershed. The nearest gage is five miles downstream on Sugar Creek and serves an area of 509 square miles. Lye Creek Drain Watershed contributes only three percent of the drainage area of the gage.

The average number and percent of flood events by months at the USGS gage at Sugar Creek are summarized below.

Month	Average No.	Percent of Total
January	0.64	10.53
February	0.57	9.36
March	0.96	15.79
April	1.04	16.96
May	0.57	9.36
June	0.71	11.70
July	0.54	8.77
August	0.11	1.75
September	0.21	3.51
October	0.18	2.92
November	0.21	3.51
December	0.36	5.85
Total	6.11	100.00

The 100 year peak discharge on Lye Creek at the downstream watershed boundary is approximately 4,300 cfs, and on Lye Creek Drain at its junction with Lye Creek, about 1,300 cfs. During droughty summer periods Lye Creek Drain has little or no flow.

The Indiana State Board of Health and Stream Pollution Control Board do not maintain water quality monitoring stations within the watershed; therefore, no water quality classification for the streams or ditches has been established.[1/] The United States Geological Survey (USGS) in

1/ Indiana Water Quality - 1970: Indiana State Board of Health and Stream Pollution Control Board, 1970.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

E. Environmental setting

1. Physical resources - cont'd

cooperation with the IDNR, Division of Water, studied the water resources of Montgomery County in a report published in 1965. One surface water sample was taken from Lye Creek Drain and another from Lye Creek about one-half mile below the watershed boundary. Two other samples were taken from the two streams (Bower Creek and Little Potato Creek) that join to form Lye Creek about one mile north of the junction of Lye Creek Drain with Lye Creek. Results of the analyses of the samples are tabulated below and serve as an indicator of the water quality of Lye Creek Drain compared to other streams in the same vicinity.[1/]

NAME	LYE CREEK DRAIN	LYE CREEK	BOWER CREEK	L. POTATO CREEK
Location	County Rd. Br. SE¼, NW¼ SEC.25,T20N,R4W	County Rd. Br. SE¼, NE¼ SEC.1,T19N,R4W	County Rd. Br. SE¼, SE¼ SEC.8,T20N,R3W	County Rd. Br. SW¼, NW¼ SEC.21,T20N,R3W
Date	9-12-61	9-12-61	9-12-61	9-12-61
Temp (^{o}F)	78	78	84	84
Iron (ppm)	.3	.1	.2	.2
Bicarbonate (ppm)	371	346	244	351
Sulfate (ppm)	72	46	34	34
Chloride (ppm)	8	12	8	8
Hardness as $CaCO_3$ (ppm)	344	300	260	292

1/ Ground Water Resources of West-Central Indiana: Montgomery County: IDNR, Division of Water, Bulletin #27, 1965.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

E. Environmental setting

1. Physical resources - cont'd

As a part of a biological review, the IDNR, Division of Fish and Wildlife made a simple water quality assessment of Lye Creek Drain in September, 1972. They found a temperature of 66° F, dissolved oxygen content of 7 ppm, and a pH of 8. They stated the drain does not deteriorate the water quality of Lye Creek or affect its sport fishery.[1/]

The USGS, Water Resources Division in Indianapolis conducted a water quality assessment of the watershed in late April 1974. They have completed their investigations and pertinent activities and conclusions follow: [2/]

Reconnaissance sampling was conducted on fourteen sites on April 24, 1974. Five stream sites, one large tile drain and two small tile drains were sampled in detail on April 30, 1974. Field water-quality and stream flow measurements were made and samples were collected for laboratory analysis for some or all of the following: common inorganic constituents, selected metals, nutrients, bacteria, insecticides and certain fractions of the biologic community.

The location of data collection sites, site descriptions and analytical data are tabulated in Appendix A-9.

The data indicate that water quality is generally good, although agricultural fertilizers and insecticides pose potential problems. Hardness, specific conductance, and the concentrations of the major cations and anions were found to be fairly uniform throughout the watershed.

Temperature, pH, and dissolved oxygen content were lower in the tile drain samples than in the open ditch samples.

Metal concentrations were below problem levels. Nutrient concentrations were within normal ranges for an agricultural watershed and should not be a problem with respect to public use, although they were high enough to cause enrichment and possibly some undesirable biologic growth.

Concentrations of fecal coliform and fecal streptococci bacteria show some contamination from sewage effluent and animal wastes, but levels were not alarmingly high.

1/ Lye Creek Drain Stream Survey Report, IDNR, Division of Fish and Wildlife, September 1972.

2/ A Water-Quality Assessment of the Lye Creek Drain Watershed, Montgomery County, Indiana, Open-file Report, USGS, Water Resources Division, Indianapolis, 1975.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

E. Environmental setting

1. Physical resources - cont'd

Evidence of chlordane and DDD (residual of DDT) and a significant concentration of dieldrin was found in bottom samples of Lye Creek Drain. These compounds persist long enough to enter the biological food chain.

Four aquifers as described below supply gound water to the watershed:

1. The central one-third of section 15 obtains water from Pleistocene sands and gravels associated with preglacial bedrock channels. Well depths range from 30 to 190 feet. Hardness is about 500 parts per million (ppm) $CaCO_3$ and iron content is 5 ppm.

2. The rest of the western third of the watershed gets water from Pleistocene sands and gravels found as sheet-like interbeds in glacial till. Well depths range from 15 to 100 feet. Hardness ranges from 200 to 375 ppm $CaCO_3$ and iron ranges from 1 to 7.5 ppm.

3. All of sections 11, 14, 23, and 26 and the western half of sections 12, 13 and 24 obtain water from limestone of Mississippian age. Well depths range from 40 to 185 feet. Hardness averages about 300 ppm $CaCO_3$ and iron varies from 0.8 to 2.5 ppm.

4. The eastern and southeastern parts of the watershed obtain water from siltstones and shales of Mississippian age. Well depths range from 30 to 300 feet. Hardness ranges from 200 to 450 ppm $CaCO_3$ and iron from 0.2 to over 7.5 ppm.

Yields in the first three aquifers are adequate for domestic and livestock use and often adequate for small municipal or industrial supplies. Yields in the shale and siltstone aquifer are erratic and range from totally inadequate up to adequate for small municipal and industrial use.1/

1/ Ground Water Resources of West-Central Indiana: Montgomery County: IDNR, Division of Water, Bulletin #27, 1965.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

E. Environmental Setting

1. Physical resources - cont'd

The town of Linden, one mile northwest of the watershed, has a small municipal water supply system. Two wells drilled 97 feet into Pleistocene sands and gravels (#2 in the previous discussion) supply 619 people with 32,000 gallons per day. Hardness ranges from 220 to 275 ppm $CaCO_3$ and iron ranges from 0 to 2 mg/1.[1/]

Detailed analyses of ground water quality are tabulated in Appendix A-10. [1 & 2/]

2. Present and projected population

The 1970 census shows the population of Montgomery County as 33,930, a 5.7 percent increase above the 1960 population. The rural population has increased 12.4 percent between 1960 and 1970. The watershed is located primarily in Madison township which had a 6.4 percent increase during the same period.

Area 059 as delineated by the Bureau of Economic Analysis, Department of Commerce, is comprised of Montgomery, Fountain, Warren, Benton, White, Carroll, Clinton and Tippecanoe Counties. The Office of Business Economics, Department of Commerce and the Economic Research Service, Department of Agriculture (OBERS) projections, prepared for the Water Resources Council, indicate the population for this area will about double from 1969 to 2020. Estimation for the project area was not attempted.

3. Economic resources

The watershed is agricultural, devoted to farming and associated uses. The agricultural area is under private ownership.

Cash grain is the major farm enterprise. There are 60 farms. Twenty-five are covered by cooperative agreement and have conservation plans with the Montgomery County Soil and Water Conservation District. The average size farm is 210 acres with the average farming unit being about 300 acres.

1/ Data on Indiana Public Water Supplies: Indiana State Board of Health, Bulletin # S.E. 10, 1968.

2/ Ground Water Resources of West-Central Indiana: Montgomery County: IDNR, Division of Water, Bulleting #27, 1965.

E. Environmental setting

3. Economic resources - cont'd

Corn is the major crop grown, comprising 75 percent of the cropland. Soybeans comprise 12 percent of the cropland. Pasture is about 7 percent of the watershed. The average yield is 105 bushels per acre for corn and 30 for beans. The primary uses of the land with erosion, flood and drainage problems are corn and soybeans, with current average yields of 72 and 23 bushels per acre, respectively.

Land values vary in the watershed. The average value of upland is $625 per acre, flood plain land is $500 per acre and areas with erosion and drainage problems are $475 per acre.

The Penn Central, Chicago and St. Louis, Norfolk and Western, and Monon Railroads furnish rail transportation for the farm products. Interstate Highway 74, U.S. Highways 136 and 231 and State Highways 43 and 47 furnish highway transportation and easy access to markets and service to the area. A good system of bituminous and all weather gravel roads provides easy access to these traffic arteries.

Unemployment is not a problem in the watershed. Many of the farms employ full-time hired help or seasonal part-time help. The net median farm income for Montgomery County in 1970 was $8,617.1/ The portion of the county in which the watershed is located is slightly above the average in income.

4. Plant and animal resources

The watershed contains approximately 87 percent cropland, 7 percent pasture,1 percent forest land, and five percent other. Approximately 40 percent of the other is wildlife and recreation land. The cropland is used primarily for corn and soybeans.

Information compiled by the United States Forest Service indicates that present forest stands on the flood plain consist of 60 percent soft maple-ash, 20 percent river birch-cottonwood, and 20 percent walnut-ash. Other varieties observed in combination tracts are: Oak-hickory is dominant on the upland some beech along Lye Creek in the southern portion of the watershed; hackberry, black cherry, red mulberry, boxelder, and Osage orange along the channels, black walnut along lower Armentrout Tributary; black cherry, shagbark hickory, red oak, elm, ash, sycamore, cottonwood, American basswood, silver maple, beech, hackberry, boxelder, honey locust, white oak, redbud, Osage orange, American hornbeam, elderberry, Crataegus and dogwood were found along the two mile reach of Lye Creek and lower Lye Creek Drain.

1/ General, Social and Economic Characteristics, Table 137, U.S. Department of Commerce, 1970.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

E. Environmental setting

4. Plant and animal resources - cont'd

The forest is all privately owned. The cover is limited and dispersed, occurring as small farm tracts or strips along channels. Wildlife habitat provided by the woody cover is limited but evenly distributed along channels. Many species of shrubs along with the forest species provide the existing woody cover. A few of the major shrubs, such as longleaf willow, heartleaf willow, spicebush, American black currant, ninebark, prairie rose, swamp rose, chokeberry, prickly ash, swamp sumac, poison sumac, winterberry, shrubby St. Johnswort, leatherwood, buttonbush, blackhaw, and American elder are usually located on moist to wet soils and on rich alluvial soils, Other shrubs located in open areas, in woods, and along fence rows are American hazelnut, pasture gooseberry, blackcap, raspberry, northern dewberry, pasture rose, shining sumac, poison elder, poison ivy, frost grape, Virginia creeper, dogwoods, honeysuckle and mapleleaf viburnum.

The existing grass vegetation also provides important food and cover for wildlife. A few of the most common species in the watershed are cheatgrass, bromegrass, fescue, mannagrass, bluegrass, orchardgrass, tall redtop, quackgrass, ryegrass, wild barley, oat-sphenopholis pallens, wild oatgrass, bentgrass, wood reedgrass, timothy, goosegrass, rice cutgrass, crabgrass, tumblegrass, barnyardgrass, foxtail, little bluestem, big bluestem and indiangrass. Livestock grazing has eliminated this vegetation in certain areas and has exposed the soils to erosion.

The IDNR, Division of Fish and Wildlife census information shows populations of cottontail rabbit as very good; bobwhite quail as good; ringneck pheasant as fair to good; squirrel as good; and deer as none to light over most of the watershed.

White-tailed deer utilize the bottom woodland, and bobwhite quail are common in the grassy areas at the edge of woods and in the more open woods. Some of the open wooded habitat is suitable for woodcock. A high population of muskrats is found in the ditches.

Populations of aquatic wildlife are light due to the general lack of wetland habitat throughout most of the watershed. However, several small, Type 1 wetlands are scattered in the wooded bottomland along the two miles of Lye Creek. 1/

1/ Wetlands of the United States, Circular 39, U.S. Department of the Interior.

E. Environmental setting

4. Plant and animal resources - cont'd

The variety of non-game wildlife species such as songbirds and small mammals is restricted by the monoculture of row-crop agriculture in this small watershed.1/ Some of the more common birds include the horned lark, meadowlark, killdeer, mourning dove, crow, English sparrow, cowbird, grackle, and red-winged blackbird.2/ Other game and non-game species of wildlife observed in limited favorable habitat are: black-bellied plover, starling, wood duck, woodcock, blue jay, field sparrow, song sparrow, white-throated sparrow, cardinal, chickadee, yellow-shafted flicker, red-bellied woodpecker, redheaded woodpecker, downy woodpecker, hairy woodpecker, robin, brown thrasher, mocking bird, catbird, rufous-sided towhee, yellowthroat, tufted titmous, house wren, barn swallow, goldfinch, indigo bunting, eastern kingbird, kingfisher, northern water-thrush, ruby-crowned kinglet, kestrel, turkey, vulture and great blue heron. The following hawks were identified: red-tailed, red-shouldered, broad-winged, harrier, and rough legged. Less than 50 percent of the bird and lesser mammal species of Indiana commonly occur throughout the watershed.3/

The sport fishery in Lye Creek Drain is limited. The lower segment of the channel, downstream of county road 450E is used as a spawning area. Water quality in this reach is satisfactory for fish production with approximately 7 ppm dissolved oxygen and pH of 8.4/ The following is taken from the IDNR survey.

> "In September, 1972, personnel from IDNR, Division of Fish and Wildlife, investigated the fisheries resources of this stream. An area in the lower portion of the ditch was sampled. The upper watershed had not recovered from previous channelization to the point where it could maintain fish populations in low flow periods.
>
> "The sample area was blocked off by 1/4 inch nets and treated with three parts per million 'Pro-Noxfish' rotenone. The rotenone was detoxified at the lower net to prevent fish below the sample area from being affected.
>
> "A total of 188 fish of 15 species were collected from the 150 foot station. The standing crop of fish in this area was estimated at 146 pounds per acre, of which 14.8 pounds per

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1/ Monoculture in Agriculture: Extent, Causes, and Problems, A Task Force report published by USDA, October 1973.

2/ American Wildlife and Plants by Martin, Zim and Nelson - 1951; and Audubon field check list for birds of Indiana.

3/ Distribution of the Mammals of Indiana: Russel E. Mumford, Indiana Academy of Science - 1969.

4/ Lye Creek Drain Survey Report: IDNR, 1972.

acre were sport species. Sport fish collected included green sunfish, longear sunfish, white sucker, and yellow bullhead. The sport fishery in this stream was limited and did not appear to be utilized by anglers.

"The ditch above the sample station had not regained the capability of sustaining a significant fish population in low flow periods, but it has recovered sufficient bank vegetation to maintain satisfactory water quality."

A high percentage of the 15 species found are forage type which are part of the food chain system supporting sports fisheries in Lye Creek and Sugar Creek. There are more than 225 miles of perennial streams supporting fisheries within Sugar Creek Basin. Of this total, only one mile of spawning area is located in the lower reaches of Lye Creek Drain.

Lye Creek Drain above Road 450E may not support a year round fishery but it is utilized by fish in higher water periods in spring. Biologists have observed fish 4 to 5 inches long, both at the mouth of Durham Ditch and above it in Lye Creek Drain in late April 1974.

No rare or endangered species have been identified as being dependent upon habitat conditions in this watershed.

All the land within the watershed is privately owned and access to the existing resources is available only by permission of the landowner.

5. Recreational resources

The Linden Conservation Club, a private organization, has the only recreational area within the watershed. This area consists of a two acre lake for fishing. Other outdoor recreation activities of any significance in the watershed are quail hunting and rabbit hunting. There is very little or no fishing on Lye Creek Drain, however, some fishing occurs on Lye Creek within the watershed boundaries.

There are no potential areas identified for major recreational development within the watershed.1/ However, individual recreation activities such as hunting for and collecting mushrooms, bird watching, hiking, nature study, and picnicking exist along Lye Creek.

1/ An Appraisal of Potentials for Outdoor Recreational Developments in Montgomery County, Indiana: Prepared by the Montgomery County Soil and Water Conservation District, 1968.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

E. Environmental setting

6. Archaeological, historical and unique scenic resources

There are no entries for Montgomery County, Indiana in the National Register of Historic Places.[1/] The Indiana Guide to Historic Places lists several places of historic interest in the county. Most are buildings in Crawfordsville, and none are in the watershed.[2/]

The two-mile long section of Lye Creek which passes through the watershed is fairly well entrenched and has several stretches of scenic woodland along it. Purdue University's Darlington Woods Farm is within a mile of the watershed and is a scenic, well managed woodland along Lye Creek.

A sixty-acre remnant of wet prairie lies just south of the project area. Thirty acres of this area was burned to a depth of three feet during the drought of 1935 and is known as the Lye Creek Prairie Burn.

An archaeological study of the Indiana Historical Society was completed in July, 1974. Five sites were identified.[3/] All were located on higher elevations within the project, thus none should be affected by proposed works of improvement.

Investigations indicate that installation of the project will not encroach on any known archaeological values, any historic place or, any planning by the IDNR for historic preservation. However, if artifacts or other items of archaeological or historical significance are uncovered during construction, the state historic officer and the National Park Service will be notified.

7. Soil, water and plant management status

The present trend in land use is essentially stable with only a slight increase each year in cropland and woodland acreage with an accompanying decrease in pasture.

Adequate local funds are available for applying needed land treatment practices. There is a shortage of local contractors to apply conservation practices.

1/ National Register of Historic Places: National Park Service, Feb. 1973.

2/ Indiana Guide to Historic Places: Indiana Department of Commerce, 1973.

3/ Archaeological Survey of the Lye Creek Drain Watershed: Indiana Historical Society, 1974.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

E. Environmental setting

7. Soil, water & plant management status - cont'd

Approximately 415 acres of the 802 acres of muck soils used for cropland are protected from flooding by a continuous spoil bank along adjacent channels. The existing pump drainage system provides adequate drainage for part of the area. Additional protection and drainage are needed for efficient use of this area as cropland.

Approximately 7,791 cropland acres of mineral upland soil have an inherent drainage problem that has been partially corrected. Additional drainage is needed for most efficient use of this land as cropland.

Soil loss on 2,431 acres of gently to moderately sloping cropland exceeds tolerable limits. This excess soil loss decreases the productivity of the land and increases production costs of crops. Adequate conservation practices should be applied to reduce average annual soil loss to a tolerable limit of 3.5 tons per acre.

The watershed is serviced by the Montgomery County Soil and Water Conservation District which is active in the preparation of conservation plans and application of land treatment measures by the landowners and operators.

Adequate forest fire protection is provided for the forest land by the IDNR, Division of Forestry in cooperation with the U.S. Forest Service through the Clarke-McNary Cooperative Forest Fire Control Program.

There are 60 farms in the watershed and 25 (41%) of the farms have conservation plans with the soil and water conservation district.

Acres and precentage by land use of land considered adequately treated are: 4,825 acres cropland, 43%; 429 acres pasture, 48%; 50 acres forest land, 36%; and 410 acres other, 60%. This represents 5,634 acres which comprises 43 percent of the total watershed.

The percentage of conservation practices needed in the watershed which are presently applied on the land are as follows:

Practice[1/]	Practice Unit	Percent Applied
Contour Farming	Ac.	(43%)
Grade Stabilization Structure	No.	(50%)
Grassed Waterway or Outlet	Ac.	(44%)
Conservation Cropping System	Ac.	(52%)
Minimum Tillage	Ac.	(64%)
Crop Residue Use	Ac.	(64%)
Subsurface Drains	Ft.	(90%)
Pasture and Hayland Planting	Ac.	(97%)
Pasture and Hayland Management	Ac.	(48%)

1/ See Appendix A-1 for definition of practices

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

E. Environmental setting

7. Soil, water and plant management status - cont'd

Cost-sharing for some conservation practices is available through the Agricultural Stabilization and Conservation Service which administers the Rural Environmental Conservation Program.

8. Projects of other agencies

The Corps of Engineers, Louisville District, studied a multiple purpose reservoir on Sugar Creek, located about three miles downstream from the confluence of Lye Creek with Sugar Creek. This structure, if installed, would cause a backwater condition during flood stage into Reaches B and D of the watershed.

In an announcement dated April 17, 1974, the Corps stated that studies indicated the structure to be not economically feasible.

There are no other water resource development projects in operation or being considered by other agencies or groups that would affect or be affected by the installation of measures proposed in the work plan.

F. Water and related land resource problems

1. Land and water management

Many areas of the watershed now under cultivation have soils with erosion problems and drainage limitations. The ability of these soils to sustain efficient production depends on the establishment and maintenance of needed conservation practices. (Appendix A-2).

Muck soils, because of their low-lying position in the topography and because they normally subside with removal of excess water, have an outlet problem for drainage. The muck area located just west of the Durham Ditch has a pump to provide an outlet for the tile system.

Flooding and drainage is a problem on approximately 3,320 acres in the watershed. The total area subject to overbank flooding is 1,330 acres.

Most severly affected within the water problem area are scattered surface depressions and low areas adjacent to inadequate channels. Damaging effects are expressed through impaired root and plant growth, increased disease, greater competition from weeds, reduced crop quality, and delayed field work. Low economic returns do not permit the landowners to apply management for top efficiency.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

F. Water and related land resource problems

1. Land and water management - cont'd

Overall economic capabilities of landowners and operators present no limitation to application of conservation practices. There is a need for additional conservation contractors; however, this factor is not expected to seriously delay implementation of needed practices.

There is a continuing need for information and education programs to effectively reach and motivate the landowners and operators who must carry out the land treatment measures.

2. Floodwater damages

Floodwater damage is primarily caused by out of bank flows and high water restricting the operation of tile outlets. The flood plain is used for agricultural uses only. Damages occurring on agricultural areas include reduced crop and pasture yields and increased crop production costs.

Corn is the predominant crop in the flood plain with a less amount of soybeans. There are 28 landowners affected by out of bank flooding.

In reach A on Rusk Ditch north of road 900N and Durham Ditch of reach B, flooding begins at about the 0.5 year frequency storm. In the remainder of reach A, flooding starts at about the 5 year frequency storm. In the remainder of reach B, flooding starts at about the 2 year frequency storm and on reach C flooding starts at about the 3 year frequency storm.

The watershed was divided into four reaches for evaluation. Reach A includes the upstream portion of Lye Creek Drain from road 800N, including the Rusk Ditch drainage area. This area contains 3,660 acres. Reach B from the junction of Lye Creek and Lye Creek Drain upstream to road 800N and contains 4,545 acres. Reach C contains 1,785 acres and is the Armentrout Tributary. Lye Creek from the junction of Lye Creek Drain downstream to road 600N, including Armentrout Drain, comprises Reach D containing 3,045 acres. The following table shows the "without project" average annual flooded acres and damage by reach:

Reach	Acres	Damage
A	220	$1,640
B	270	5,820
C	20	360
D	350	3,030

A flood that would happen once in 50 years would affect about 1,300 acres and cause approximately $23,100 damage, while a two year flood would affect 420 acres and cause approximately $6,400 damage.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

F. Water and related land resource problems - cont'd

3. Erosion damages

Most erosion damages are attributable to sheet erosion on 2,431 acres of cropland or 19 percent of the watershed. Average loss on these acres is 5.68 tons/acre/year. The average tolerable limit is 3.57 tons/acre/year.

Present average sheet erosion rates in tons/acre/year for each land use are shown below:

Cropland	Pasture	Forest Land	Other	Watershed
1.22	0.05	0.53	0.79	1.11

Soil loss from gully erosion is estimated at five percent of the sheet erosion soil loss. Streambank, streambed, and flood plain erosion losses are estimated at ten percent of the sheet erosion soil loss. All other erosion losses are estimated at five percent of the sheet erosion soil loss.

The area with erosion problems is limited. Although sheet erosion is significant in small, local areas, it is not a detriment to most of the cropland within the watershed. Wind erosion on muck soils is minor.

The major soil erosion areas are scattered throughout the Miami-Russell-Fincastle soil association. This association extends through the central portion of the watershed running north and south with a small area on both the east and west side (Appendix A-7C).

4. Sediment damages

Sediment yields are low and ditch flow is intermittent; however, over a period of time some sediment has accumulated in the lower gradient channels at ditch junctions. This is not a major problem and is insignificant when compared to flooding and drainage damages.

The average annual sediment yield from Lye Creek Drain (9,991 acres) is estimated at 1,725 tons/year. The sediment contributed by the entire Lye Creek Drain Watershed (13,035 acres) to Lye Creek is 2,505 tons/year.

5. Joint problems (flooding and drainage)

Agricultural drainage problems exist because of shallow channel depths and lack of channel capacity. Open and closed drains are restricted during

flood events. The most significant problems are recurring patterns of drainage impairment and flooding occurring throughout the growing season. Damaging effects are expressed through impaired root and plant growth, increased disease, greater competition from weeds, reduced crop quality and delayed field work. Reach A contains 1,490 acres with joint problems Reach B, 1,240 acres, and Reach C, 590 acres. Costs of production are driven upward and yields downward; consequently fewer inputs such as management, maintenance, and labor and materials are applied to this area. Average annual yields in the area fffected by poor drainage outlets are reduced by an estimated 30 bushels per acre for corn and 10 bushels per acre for soybeans

Adequate drainage is a need long recognized by local landowners. The entire system of drainage ditches was completed about 50 years ago. Successive attempts by individuals to keep their ditches cleaned out have been made since then in order to maintain an adequate outlet for the installed tile systems.

The lack of adequate outlets on Lye Creek Drain, Rusk Ditch, Durham Ditch and Armentrout Tributary and lack of maintenance on existing channels has resulted in the deterioration of a large portion of these drains. Drains are now inadequate either for passage of floodwater or to serve as suitable drainage outlets. Additional depth and capacity are needed to provide adequate outlets on Lye Creek Drain and its three tributaries.

Tile and surface drainage systems (field ditches, grass waterways). are needed to alleviate drainage problems.

The principal soils in the drainage problem areas are Westland, Mahalasville, Brookston and muck soils.

6. Recreation problems

Water quality and sediment are not significant problems in the stream or ponds having recreation potential in the watershed. Hunting and fishing with the landowners permission, are the only activities available to the general public in the watershed.

The watershed is in the Bureau of Economic Analysis Area 059. OBERS population projection for this area in the year 2000 is 388,800 compared to 249,412 in 1969.

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

F. Water and related land resource problems

6. Recreation problems - cont'd

There has been very little interest shown by the local people in developing recreational resources.

7. Plant and animal problems

The original vegetation for the area was primarily trees. The remaining one percent forest land and two percent wildlife and recreation land provides very limited permanent cover for wildlife. An improved balance of land use to provide fish and wildlife habitat is desirable.

The forest land ownership pattern is small and scattered, averaging seven acres per landowner. Erosion and sediment yields are minimal. The primary problem is bringing forest land under management.

Flood damages to forest land and fish and wildlife are too small to quantify. The water quality in the streams is good except for small quantities of agricultural sediment and chemicals (See Environmental setting - Physical resources).

8. Water quality problems

Water quality is generally good, although fertilizers and insecticides pose potential problems. A detailed account of water-quality is presented in the Environmental setting, Physical resources section.

9. Economic and social problems

The net median income per family in Montgomery County for 1970 was $9,531. The net median income per family for the state of Indiana in 1969 was $9,970.[1/] The net median income for all farms in the county was $8,617 and for the state was $8,198.

The watershed is not considered an economically depressed area.

Unemployment is not a problem. The farms in the watershed are family farms. Approximately 20 percent of the farmers use hired help or seasonal part-time help.

1/ General, Social and Economic Characteristics, U.S. Department of Commerce, 1970.

IV. RELATIONSHIP TO LAND USE PLANS, POLICIES, AND CONTROLS

The Lye Creek Drain Watershed is presently used for agricultural purposes. The soils are considered prime for cropland, specialty crops, and pasture. Residential use is either for landowner farmsteads or scattered housing along the road systems. There are scattered subdivisions appearing in the countryside, mainly to the north from the influence of the Lafayette-West Lafayette urban area. However, urbanization is not expected to be a factor within the watershed for the near future.

At the present time, Montgomery County does not have a land use planning commission. (There is existing authority for the establishment of land use planning commissions.)

If residential-urban land use becomes a significant problem, the proper authorities will be encouraged to initiate proper land use ordinances.

V. ENVIRONMENTAL IMPACT

A. Conservation land treatment

Effects attributable to conservation land treatment measures will be realized throughout the watershed. Such effects accrue on site and are evidenced through increased efficiency in the use of cropland, pasture,forest land, and other land.

The application of land treatment measures will bring an additional 5,072 acres under adequate treatment. Conservation practices to be applied to cropland are contour farming, grassed waterways, grade stabilization structures, conservation cropping systems, crop residue management, and minimum tillage. These practices will reduce erosion through interception of rainfall and reduction of runoff and stabilization of drainageways. Reducing sheet erosion will permit inherent and applied fertility to be maintained. The use of conservation cropping systems, including minimum tillage, will provide improved plant growth through improvement of soil characteristics. The combined effects of these practices will reduce average annual soil loss on 2,431 acres of cropland from 5.7 tons/acre/year to 3.2 tons/acre/year. This rate is below the tolerable amount of 3.5 tons/acre/year.

Conservation practices will reduce erosion and sedimentation by 41 percent and decrease the watershed's contribution of sediment to Lye Creek from 2,505 tons/year (2.30 acre-feet/year) to 1,485 tons/year (1.36 acre-feet/year). The reduction in sediment yield combined with better agronomic management and less intense crop rotations will reduce the nutrient content of the runoff waters.

Removal of surplus water through installation of subsurface drains, drainage field ditches, and drainage mains or laterals will enhance growth on 3,272 acres of cropland with a wetness limitation. Reduced costs, improved crop quality, and increased yields will increase the efficiency for the farm enterprise.

Pasture management practices to be applied on 243 acres will improve the overall quality and productivity of pasture areas. Such areas, when properly treated and managed, complement the overall farm operation, contributing significantly to farm income with a minimum of erosion.

Forest land treatment measures to be applied to 68 acres will improve the overall hydrologic condition of the watershed. Creation of a good humus layer in these areas will reduce runoff and erosion. Approved cultural operations and livestock exclusion from forest land will improve the overall quality of future forest land production as well as increase the quantity of production.

V. ENVIRONMENTAL IMPACT

A. Conservation land treatment - cont'd

Many species of wildlife will benefit from vegetative land treatment measures that contribute to the quality and quantity of wildlife habitat. Some of these are: waterways, diversions, pasture, tree planting, critical area planting and protection from grazing.[1/]

Projected land use changes, in acres, as a result of such factors as increased crop production, trends in land use, improved watershed protection and changes in farm management are shown below:

	Cropland	Pasture	Forest Land	Other Land
Present	11,315	891	129	700
Future	11,594	737	141	563
Change	+ 279	- 154	+ 12	- 137

B. Structural measures

Joint floodwater-drainage problems occur throughout Reaches A, B, and C. Benefits will be obtained by removing surplus surface and subsurface water. Many tile drains currently operating unsatisfactorily because of poor outlet conditions will become operational. Farming operations will proceed on a timely basis. A total of 3,320 acres will benefit from joint floodwater-drainage relief. Approximately 50 farming operation units will benefit from the project.

The planned channel work will provide average annual floodwater damage reduction of approximately 84 percent.

The channel work will widen and deepen approximately 10.2 miles of intermittent, manmade channels. The deepening for drainage will have a minor impact on the watertable level immediately adjacent to the channel. An additional 1.1 miles of channel work will be done to remove debris only.

1/ Reference--Wildlife Response to Selected Conservation Practices, Biology Technical Note No. 6, Soil Conservation Service.

V. ENVIRONMENTAL IMPACT

B. Structural measures - cont'd

A summary comparison of flooded areas without and with the project is presented below:

Reach	Without or With Project	Flood Frequency1/ 100 yrs.	5 yrs.	2 yrs.
A	WOP	340 Ac.	167 Ac.	63 Ac.
	WP	215	48	28
B	WOP	725	334	212
	WP	325	124	30
C	WOP	78	27	9
	WP	63	13	--
D	WOP	186	169	159
	WP	188	172	163

The increased flooding in Reach D as shown in the above table is considered minor. The additional area involved is estimated at 2 to 4 acres throughout the frequency range. Also, the increase in flow depth is estimated to be one-tenth of a foot.

The fishery, downstream of county road 450E, will be damaged during installation of the planned channel by construction-related sediment, disturbance of established streambed, and removal of woody growth on the south side of the channel. The removal of shade will result in an increase in water temperature.

The six fishery pools and deflectors to be installed in the same area will be installed downstream of road 450E to offset the damage to fishery habitat.

The planned channel work will destroy approximately 15 acres of woody habitat along the present channels. Approximately 21 acres of trees and shrubs will be planted on the spoil bank to mitigate the 15 acres destroyed. An additional eight acres of existing woody habitat and 13 acres of idle land suitable for wildlife habitat will be protected within the permanent easement on the unconstructed side of the channel.

All disturbed land within the permanent easement area, about 58 acres, will be seeded with a grass and legume mixture to provide herbaceous cover for wildlife.

Construction activity will create some sediment in the channel. Sediment traps and approved methods of construction will minimize sediment damage. The proposed design of the channel will provide for improved bank stability. Noise and air pollution will increase during construction.

1/ A flood frequency of 100 years means that in any one year there is a one percent chance of this size flood or larger occurring.

V. ENVIRONMENTAL IMPACT

B. Structural measures - cont'd

The USGS water quality report identified concentrations of chlordane, DDD, and dieldrin in the ditch bottom of Lye Creek Drain. These pesticides are attached to soil particles as a normal chemical reaction. Therefore, most of these contaminats will be removed and spread as spoil during excavation. The sediment particles agitated into suspension during construction will settle in sediment traps which will be installed as part of and preceding construction activities. The spoil will be stabilized by adequate vegetation directly following construction. Water quality specialists from the Environmental Protection Agency and the Soil Conservation Service are not aware of any research data concerning plant uptake of these pesticides. However, they believe that the amount of contaminats entering the food chain system would be insignificant.

C. Economic and social effects

During the period of construction, approximately 16 man-years of labor will be required for installation. During the life of the project, about 0.7 man-years will be required annually for the operations and maintenance.

The quality of living for the beneficiaries of the project should be improved because of the benefits realized from the project. The average benefit for 50 farm units will be approximately $1,100 annually.

Secondary effects generated by the project will be through increased demands on local suppliers of goods and services and on local processing, transporting and marketing facilities.

Total average annual benefits from structural measures are an estimated $54,480, which includes flood damage benefits of $6,760, more intensive land use benefits of $19,840, agricultural water management (drainage) benefits of $17,700 and local secondary benefits of $10,180.

A four-year installation period is planned.

The ratio of average benefits of $54,480 to the average annual cost of $31,460 is 1.7 to 1.0 (See Appendix C - Comparison of Benefits & Cost).

V. ENVIRONMENTAL IMPACT

D. Favorable environmental effects

The following project effects are considered favorable to the total environment:

1. Adequately treat 5,072 additional acres bringing the total to 10,706 acres (82%) of the watershed lands, thus improving productivity on all land uses.

2. Reduce soil loss on 2,431 acres of eroding cropland to within tolerable limits and improve channel bank stability, thus reducing soil loss and sediment yield from the entire watershed by 41 percent.

3. Provide joint flooding and drainage relief on nearly 3,320 acres and reduce average annual damage by 84 percent.

4. Provide wildlife habitat through: (1) installation of vegetative treatment measures, (2) a net gain of 12 acres of forest land and management of 68 acres of forest land, (3) protection of eight acres of woody habitat and 13 acres of idle land within the permanent easement on the unconstructed side, (4) planting of 21 acres of trees and shrubs on the spoil bank, and (5) the creation of six fishery pools with deflectors.

5. Improve the quality of life and increase demands on business within the area.

6. Provide increased soil protection and some benefit to the forest based economy of the surrounding area through: (1) forestation plantings resulting in a net gain of 12 acres of forest land, (2) management and treatment of 68 acres of forest land, and (3) protection of forest land.

E. Adverse environmental effects

The following project effects are considered adverse:

1. Damage to the stream fishery during construction activities of the lower one mile of Lye Creek Drain.

2. Destruction of 15 acres of woody habitat as a result of channel work.

3. Increased noise, air, and water pollution (turbidity) during construction.

VI. ALTERNATIVES

The following alternatives were considered:

1) One alternative would be the installation of the planned conservation land treatment only. This alternative would have the same beneficial effect in the upland areas as the proposed plan. Sediment contribution to Lye Creek would be reduced by 41 percent. The installation costs would be $34,770.

2) Pumping was studied as an alternative to a complete channel system. Approximately 8.2 miles of channel work would still be required and also levees in some reaches. The channel work would be eliminated on the lower end of Lye Creek Drain where a spawning area has been identified. The other environmental impacts and benefits would be similar to the planned project. The average annual cost is estimated to be $48,080.

3) Nonstructural measures to reduce flood damages were studied as an alternative. The flood plain acreage is agricultural land with no buildings. A method of flood plain management would be to convert 230 acres of cropland, that is now flooded on the average of one time every two years, to a less intensive agricultural use. Portions of Reaches A and C and all of Reach B would be converted. As a part of this alternative, channel work would still be required in Reaches A and C to retain the drainage benefits.

   The environmental effects of this alternative would be to eliminate adverse effects and have favorable environmental effects due to the cropland conversion in Reach B. The impacts in Reaches A and C would remain the same.

   The channel work in Reaches A and C would retain approximately $19,500 of drainage benefits. The average annual net return foregone by converting cropland to pasture would be approximately $16,000. The average annual cost is estimated to be $22,400.

4) Another alternative would be "no PL-566 project--no local action." The on-going land treatment program will in time also reduce sediment contribution to Lye Creek by 41 percent. Floodwater and drainage damages will increase over present condition. The estimated net annual monetary benefits that would be foregone by not implementing the planned project are $23,020.

VI. ALTERNATIVES - CONT'D

However, drainage and flooding relief have been a concern of the local people for many years. It is likely that they would attempt to obtain relief through other means. Group projects or work through the county drainage board would be logical approaches. Channel work or on-farm pumpting systems could be used to obtain some relief, although any program implemented by the local people would likely not give as full consideration to environmental criteria as the planned PL-566 project.

VII. SHORT-TERM VS. LONG-TERM USE OF RESOURCES

Land use is expected to remain reasonably stable, with minor decreases in pasture and idle land and corresponding increases in cropland and forest land. The entire watershed is agriculturally oriented being 87 percent cropland. The area is best suited for cropland, pasture and woodland. The project is considered compatible with these trends.

The project will solve the majority of flooding, erosion, sedimentation, and drainage problems within the watershed. With the specified operation and maintenance program, it will function over its designed 100-year life or longer.

The project will restrict options for long-term land use in the 124 acres to be included within the permanent easement area along the channel. This area contains 35 acres of channel area, 22 acres of woody vegetation, 30 acres of cropland, and 37 acres of grassland. Future use of this area will be 43 acres of channel area, 23 acres of woody vegetation and 58 acres of grassland.

Within the Wabash Subregion, the status of watershed activity is as follows: construction completed - 2; authorized for construction - 13; authorized for planning - 7; applications received and awaiting further action - 24.

The watersheds completed and authorized for construction represent 1,212 square miles or 5.8 percent of the Wabash Subregion.

Lye Creek Drain Watershed is part of the Lye Creek Watershed which was identified as an Early Action project by the Wabash Comprehensive Study. The Lye Creek Drain Watershed has an area of 20.37 square miles or 25.9 percent of the Lye Creek Watershed.

Lye Creek Drain Watershed covers 0.097 percent of the Wabash Subregion; therefore, any effect it would have on the subregion is considered negligible.

The Lye Creek Drain Watershed project is being considered for inclusion in the Wabash Basin as part of the Comprehensive Coordinated Joint Plan (CCJP) being developed by the Ohio River Basin Commission. Adoption of the project as part of the CCJP is expected prior to the completion of the Final Work Plan and Environmental Impact Statement.

VIII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The capital funds required for the project are $540,830 including associated costs. This includes costs for land and labor.

The energy expended for project installation is irretrievable.

Land usage within the project permanent easement area before and after project follows:

Land Use	Present	Future
Channel Area	35	43
Cropland	30	--
Forest land	22	23
Grassland	37	58

These conversions are considered to be committed for the project life.

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

A. General

The original application was approved by the IDNR for the 7,040 acre Armentrout Dredge Ditch Watershed on June 15, 1965.

The Montgomery County Soil and Water Conservation District passed a resolution on July 9, 1968 requesting that the name of the watershed be changed to Lye Creek Drain Watershed so that the name would be consistent with the records of the Montgomery County Surveyor's Office.

During preliminary investigations, the determination was made that the application should be amended to include about two miles of Lye Creek downstream of the junction of Lye Creek Drain and Lye Creek. At the time, it was determined that work would have to be performed on Lye Creek to provide a satisfactory gravity outlet for the then Lye Creek Drain Watershed. The amended application was approved by the IDNR on March 1, 1971. The watershed area was enlarged to the present size of 13,035 acres.

Major considerations for formulation stated in the original application were reduction of flood and drainage damages and control of erosion.

The first meeting of the steering committee and the planning staff was on April 26, 1968. Hydraulic considerations (gravity outlet vs. pumping) and discussion about the appropriate sponsor to carry out the structural works of improvement were the main topics of discussion. Another meeting was held between the steering committee and the planning staff on June 6, 1968 before completion of the Preliminary Investigation Report.

The Preliminary Investigation Report was completed in June 1968. This report recommended structural measures that are essentially those recommended in the work plan. However, it also included 2.35 miles of channel work on Lye Creek that was not recommended in the work plan. A meeting to discuss the report findings with the steering committee was held September 16, 1968.

USDA authorization for planning was received in November, 1971. During planning, meetings were held with the Montgomery County Drainage Board on October 15, 1973 and February 25, 1974 to review plan formulation.

Biology field reviews were carried out in the watershed in March. 1972 and November, 1972. Representatives of U.S. Fish and Wildlife Service; IDNR, Division of Fish and Wildlife; and the SCS participated in these reviews.

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

A. General - cont'd

A meeting was held in Indianapolis on January 30, 1974. The primary purpose was discussion and recommendation of elements for the abridged edition of an environmental quality plan that is attached as an addendum to the work plan.

The groups or agencies represented in attendance were:

Ball State University
Environmental Protection Agency
Montgomery County:
    Historical Society
    Soil and Water Conservation District
    County Surveyor
Indiana University, Glenn A. Black Laboratory of Archaeology
Indiana Farm Bureau, Inc.
Purdue University, Cooperative Extension Service
Department of the Interior:
    Bureau of Sport Fisheries and Wildlife
    U.S. Geological Survey
IDNR, Division of Fish and Wildlife
USDA, Soil Conservation Service

Others sent invitations, written or by telephone, but not in attendance were:

Wabash Valley Association
Izaak Walton League
Indiana Conservation Council, Inc.
DePauw University
U.S. Army Corps of Engineers
Audubon Society, Amos W. Butler Chapter
Indianapolis Star, Outdoor Sports
Montgomery County:
    Commissioners
    Drainage Board
    Extension Agent
Indiana State Board of Health
IDNR:
    Natural Resources Commission
    State Historic Preservation Officer
    Division of Natural Preserves
    Division of Forestry
    Division of Outdoor Recreation

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

A. General - Cont'd

During the informal field review stage for the first draft to the work plan and the environmental impact statement, the following groups or agencies were asked to review and comment on the documents:

Amos W. Butler Audubon Society
Izaak Walton League
Indiana Conservation Council, Inc.
Indiana Department of Natural Resources
Cooperative Extension Service, Purdue University
U. S. Fish and Wildlife Service
District Engineer, Army Corps of Engineers
Indiana Farm Bureau, Inc., Natural Resources Department
Environmental Protection Agency
Montgomery County Soil and Water Conservation District
Steering Committee, Lye Creek Tributary Watershed
Montgomery County Drainage Board
Glenn A. Black Laboratory of Archaeology
Indiana Historical Society
Montgomery County Commissioners
USDA, Forest Service
USDA, Office of the General Counsel
USDA, Farmers Home Administration
USDA, Agricultural Stabilization and Conservation Service
Wabash Valley Interstate Commission
Ohio River Basin Commission
U. S. Geological Survey
State Soil and Water Conservation Committee
Bureau of Mines
Indiana Association of Soil and Water Conservation Districts
Indiana Clearinghouse Review Officer
Indiana Stream Pollution Control Board
USDA, Economic Research Service
National Marine Fisheries Service
Natural Resources Department, Ball State University
Wabash Valley Association

A public information meeting was held June 26, 1974 in Linden, Indiana, to explain and review the work plan and environmental impact statement. Twenty-five people were in attendance. No significant objections or environmental issues were raised.

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

B. Discussion and disposition of each comment on draft environmental statement

Comments were requested from the following agencies:

Water Resources Council*
Ohio River Basin Commission
Department of the Army
Department of Commerce*
Department of Health, Education and Welfare
Department of the Interior
Department of Transportation
Federal Power Commission*
Office of Equal Opportunity, USDA*
Advisory Council on Historic Preservation
Indiana Department of Natural Resources (for Governor)
Indiana State Clearinghouse*
Indiana State Historic Preservation Officer 1/
Environmental Impact Assessment Project*
Natural Resources Defense Council*
Indiana Historical Society*
Environmental Defense Council*
National Wildlife Federation*
National Audubon Society
Friends of the Earth*

*Did not respond

SUMMARY OF COMMENTS AND RESPONSES

Each issue, problem, or objection is summarized and a response given on the following pages. Comments are serially numbered. The original letters of comment appear in Appendix D.

Ohio River Basin Commission

1) Comment: The Atomic Energy Commission and the Department of Housing and Urban Development were not listed as agencies from which written comments were requested.

Response: The watershed is of rural nature. Neither of the aforementioned agencies are listed under the categories of "Land Use and Management" or "Flood Plains and Watersheds" as federal agencies with jurisdiction by law or special expertise to comment on various types of environmental impacts (Appendix II, Council on Environmental Quality guidelines for statements on proposed federal actions affecting the environment, Federal Register, Vol. 36, No. 79, Friday, April 23, 1971).

2) Comment: Suggested rewording of the paragraph relating to the Comprehensive Coordinated Joint Plan on page 24 of the Work Plan and on page 40 of the Environmental Impact Statement.

Response: Concur, changes were made on both documents.

1/ The Director of IDNR is designated as the State Historic Preservation Officer. Comments from him are considered as encompassing both responsibilities.

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

B. Discussion and disposition of each comment on draft environmental statement - cont'd

U. S. Department of the Interior

1) Comment: The term "stream improvement" should be clarified in the Abbreviated Environmental Quality Plan attached as an addendum to the Work Plan.

Response: Item No. 9 under the Plan Elements on page 4 of the Abbreviated Environmental Quality Plan gives definition of the term "stream improvement" as used here.

2) Comment: Page 5 of the Work Plan and page 14 of the Environmental Impact Statement (EIS) should mention the presence of a number of small Type 1 wetlands in the wooded flood plain along Lye Creek.

Response: Concur. This information has been added on page 5 of the Work Plan and page 14 of the EIS.

3) Comment: Page 6 of the Work Plan and page 15 of the EIS--the water level of Durham is controlled by pumping rather than gravity flow. There is also a large new lateral ditch paralleling Lye Creek Drain.

Response: Durham Ditch is pumped into but it does operate by gravity. The other ditch mentioned is a small farm ditch and not included in the project measures. We do not believe that a description of this and other side drainage adds significant information to the Environmental Setting.

4) Comment: The Work Plan page 13 and EIS page 21 refer to forest stands of soft maple-ash, river birch-cottonwood, and walnut-ash. Location of these stands should be given. The majority of upland woodlots are oak-hickory but is not included.

Response: Appropriate changes have been made in both documents to indicate that the stands mentioned were primarily on the flood plain and to reflect the oak-hickory dominance on the upland.

5) Comment: Paragraph three on Work Plan page 13 and paragraph four on EIS page 22, are not entirely accurate. We agree that woody habitat is not extensive along the four drains where project activity is proposed; however, there are some wooded areas on the ditch banks that are important to wildlife. Although the narrowness and limited length of these wooded areas reduces their importance to large mammals

U.S. Department of the Interior - cont'd

such as white-tailed deer, they are inhabited by small mammals, birds, reptiles, and amphibians. Excellent food and cover plants such as black cherry, mulberry and blackberry predominate in these areas, making them extremely important to wildlife, especially since the majority of the watershed is in row crops which provide only limited habitat value. The woodlands along Lye Creek and lower Armentrout Drain are not limited to narrow strips along the channels but may extend 0.1 mile or more back from the streambank. These woodlands and many of the upland woodlots contain excellent compositions of species and sizes of trees. The woodlands that are not grazed and some that are lightly grazed contain high quality wildlife habitat, including food and cover.

In addition to the wet woodlands along Lye Creek, there is a small wetland in the woods at the corner of 900N and 225E Roads. The high population of muskrats in the watershed should be noted as well as the fact that harriers and kestrels also are found in the area.

Response: Appropriate changes have been made in the Plant and Animal Resources sections of both documents.

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

B. Discussion and disposition of each comment on draft environmental statement - cont'd

U. S. Department of the Interior - cont'd

6) Comment: Page 16 of the Work Plan and page 25 of the EIS--a possible significant site identified as Lye Creek Prairie Burn may lie within the project area.

Response: An appropriate paragraph has been inserted into both documents referring to the "Lye Creek Prairie Burn."

7) Comment: Page 20 of the Work Plan and page 28 of the EIS--the average number of floods during the cropping season should be indicated.

Response: The third paragraph of the section describes the frequency of flooding occurring by reach. About half of the all year flooding events occur during the cropping season.

8) Comment: The alternative of limited clearing on the construction side should be discussed in both the Work Plan and the EIS.

Response: Significant trees will be left standing on the constructed side if at all practicable during operations. The alternative of limited clearing was not studied because of the enlargement needed and the high costs involved for work of this nature with present-day equipment and methods.

9) Comment: The second paragraph on page 30 of the Work Plan and page 6 of the EIS—the approximate locations and extent of the armor plating should be provided.

Response: Channel sections requiring armor plating have been added to both the Work Plan and EIS.

10) Comment: Page 31 of the Work Plan and page 41 of the EIS--"with project" figures for land use should be included.

Response: Appropriate changes have been included.

11) Comment: Inconsistency of miles of channel work in both the Work Plan and the EIS.

Response: Corrections have been made to page 36 of the Work Plan and page 34 of the EIS.

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

B. Discussion and disposition of each comment on draft environmental statement - cont'd

U. S. Department of the Interior - cont'd

12) Comment: Page 50 of the Work Plan--why is work being done on the opposite side of the spoil bank to be repaired in Reach B?

Response: The repair to the spoil bank is minor and intermittent. Construction done on the spoil bank side would require complete displacement of the spoil bank.

13) Comment: The method of marking the permanent easement should be explained in greater detail.

Response: The easement markers, to date, have been placed on approximate 200 feet intervals and are two inch diameter steel posts that project four feet up from the ground. Experience may dictate needed changes. Therefore, no set criteria is placed in the Work Plan.

14) Comment: What will be the effects of disturbing the bottom sediments and its placement, during construction, to the food chain?

Response: Further discussion has been included on page 36 of the EIS and on page 38 of the Work Plan.

15) Comment: Has the State Historic Preservation Officer been contacted? Clarification is needed for assurance that the areas to be affected by construction were covered by the archaeological survey.

Response: The State Historic Preservation Officer was sent the draft copy of the EIS for review and comment (see page 2 and footnote 1 on page 48 of the EIS).

The survey made was to the intensity satisfactory to the recognized authorities making the survey.

16) Comment: Discrepancy in forest land acreage.

Response: The 58 acres on page 1 of the EIS was changed to 68.

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

B. Discussion and disposition of each comment on draft environmental statement - cont'd

17) Comment: A discussion on expected land use changes and their impact should be included. The list of adverse environmental effects on page 37 indicates that 154 acres of grassland and 137 acres of idle land will be changed to cropland and forest; however, we do not believe it is sufficient to list changes without addressing the impacts of these changes. For example, where are the 291 acres that will undergo land use changes located? What is their value to the wildlife of this watershed? Which species of wildlife will be most affected by the changes? Are any secondary effects anticipated, such as timber clearing because of better drainage?

Response: A change has been made in the description of the tabulation of land use changes on page 34 of the EIS and page 36 of the Work Plan. We do not believe that these land use changes can be solely attributed to the project. Therefore, this item has been removed from the summary of Adverse Environmental Effects that are a direct result of the project.

The land use change is evenly dispersed throughout the watershed. Due to the present monoculture, further land use changes to cropland could have a significant effect on wildlife values. The greatest change is grassland to cropland which may have an effect on those grassland species present in the watershed. The population of bobwhite quail and rabbit would be most affected. As stated on page 34, forest land is anticipated to increase, thus benefiting wildlife species requiring woody cover for adequate habitat.

18) Comment: Discrepancy in number of farm units benefited.

Response: The 35 units has been corrected to read 50.

19) Comment: More detail of the impacts to the stream fishery is needed on page 37 of the EIS under summary of the Adverse Environmental Effects.

Response: This section is merely a summarized listing of the impacts explained in the preceding sections under Environmental Impacts.

A sentence regarding the "increase in water temperature" was added on page 35 of the EIS and page 37 of the Work Plan.

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

B. Discussion and disposition of each comment on draft environmental statement - cont'd

20) Comment: Miles of channel work for the pumping alternative should be included. A "deepening only" alternative and a "limited clearing" alternative should also be included.

Response: The miles of channel work have been added to the "pumping" alternative.

Deepening only for channel capacity creates higher velocities and increases instability. During construction a side slope and vegetation would undoubtedly still be disturbed thereby affording little reduction in adverse effects.

See response 8 for response to "limited clearing" as an alternative.

21) Comment: On page 41, is the conversion of 291 acres of grassland and idle land to cropland and forest land as a result of the project consistent with expected without-the-project trends?

Response: "Idle land" is more properly addressed as "other land." "Other land" consists of buildings, roads, water areas, set-aside acreage, etc.

The conversion is a result of the combination of factors as shown in the change made to the introduction of the table on page 34 of the EIS. (See response #17) Much of the conversion is expected to occur as a result of land use trends without the project.

Environmental Protection Agency

1) Comment: Discussion of water quality should be expanded. Septic tank and feedlot runoff problems should be discussed.

Response: Septic tank problems were not considered significant in the watershed. There are no concentrated feedlots in the watershed. The main sources of animal wastes are a result of pasturing. There are 13,440 lineal feet of livestock exclusion from the channel planned that will reduce direct animal wastes into the stream.

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

B. Discussion and disposition of each comment on draft environmental statement - cont'd

Environmental Protection Agency - cont'd

The information presented regarding water quality in the Environmental Setting is a summary of three studies indicated by footnote. The most intensive study for the watershed is the Open-file Report prepared by the U.S.G.S. This report is available upon request from the Soil Conservation Service or the U.S.G.S.

2) Comment: The re-suspension of sediments during dredging and subsequent maintenance dredging will adversely affect water quality. The extent of the water quality effects will be determined by the physical and chemical characteristics of the bottom sediments, the type of dredging operation, and the amount of stream flow. Adverse effects on water quality could be minimized if dredging occurred during low flows. The placement of dredge spoil could effect water quality from the leaching of pollutants and erosion of the spoil banks. The EIS should discuss the physical and chemical characteristics of the spoil and utilize this information to prevent unnecessary water quality degradation resulting from placement or inadequate containment of polluted spoil. Also, environmental considerations should be made as specific as possible to the contractor and periodic inspections during construction should be made to be assured that environmental damage from construction activity is minimized.

Response: Pollution caused by channel work will be temporary and will be reduced by the installation of sediment traps during construction. Dredging operations are normally suspended by the contracting officer during high flow conditions. The soil material that will be placed as spoil will be that which is described on pages 7 and 8 of the EIS. There are no significant point sources of pollution. Any runoff from the newly constructed spoil bank will be diverted from the channel by a berm (see Appendix A-4). The pesticides present in the bottom samples of the stream (see page 18 of the EIS) will, undoubtedly, be a component of the spoil.

The spoil bank is shaped (see Appendix A-4) and seeded immediately after the dragline equipment has completed its operation. Cut slopes are seeded on the same day that the cuts are made.

Environmental Protection Agency - cont'd

The Soil Conservation Service provides inspection throughout the duration of construction activities.

3) Comment: Project impacts along Reach D and further downstream should be discussed in greater detail.

Response: No construction activities are considered in Reach D. The changed conditions are reflected on page 35 of the EIS for the reach.

The change in damages is considered too minor to quantify.

The balance of Lye Creek is quite entrenched and the stream is on a relatively steep gradient.

Again, the change in damages is considered too minor to quantify.

Work Plan: EIS and Work Plan comments closely parallel. Responses to EIS comments are considered adequate for the comments for the Work Plan.

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

B. Discussion and disposition of each comment on draft environmental statement - cont'd

Indiana Department of Natural Resources

1) Comment: The third paragraph under Section III D-1 (Land Treatment Measures) on page 4 would better read as follows:

Conservation practices to be applied on cropland include contour farming, grassed waterway or outlet, minimum tillage, crop residue use, grade stabilization structure, subsurface drain, and drainage main or lateral. A combination of two or more practices is often needed to achieve adequate treatment of land. Land treatment practices such as waterways, diversion, pasture planting and management, tree planting, critical area planting and rotation from grazing will benefit wildlife. Forestation planting, forest land treatment and forest protection will not only provide enhanced soil protection, but will benefit the forest-based economy of the surrounding area. The Soil Conservation Service Technical Guide will be used in planning alternatives for adequate land treatment.

Response: Concur. The documents were changed to read accordingly.

2) Comment: Include in the summary of Favorable Environmental Effects those benefits accruing to forest land treatment.

Response: Concur. Item #6 has been added to the summary with the suggested wording.

3) Comment: Discussion of the "Lye Creek Prairie Burn" should be discussed in the Environmental Setting.

Response: Concur. A new paragraph has been added on page 25 of the EIS and on page 16 of the Work Plan about the "Burn."

Work Plan: The rest of the comments were relevant to the Work Plan and dealt with technical engineering rather than environmental issues. These have been resolved with the Indiana Department of Natural Resources.

National Audubon Society

1) Comment: Will the deepening of Durham Ditch have an adverse effect on the area known as Lye Creek Prairie Burn, which is located just outside of the southern watershed boundary?

IX. CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

B. Discussion and disposition of each comment on draft environmental statement - cont'd

National Audubon Society

Response: The area of muck soils that make up the Lye Creek Prairie Burn will not be affected by the proposed improvement of Durham Ditch. The Lye Creek Prairie Burn is drained to the south and west. None of its drainage flows into Durham Ditch, nor is it affected by the proposed project measures.

The only muck soils drained by Durham Ditch are in an area near Road 650N (see General Soils Map--Exhibit 7C and Project Map--Appendix B). Durham Ditch, with project work, affords an inadequate gravity flow outlet for this muck area. Therefore, the present method of drainage, through the use of pumps, will continue after the project.

2) Comment: A unique opportunity exists to create a small "Lye Creek Prairie relict area" of 5 to 10 acres somewhere in the muck-peat portion drained by Durham Ditch. It would probably re-vegetate naturally with many of the rarer, wet prairie species, but biology students and staff from Wabash College would gladly help in the restoration, transplanting, and seeding of the small reserve. Such a reserve somewhere on easement land would be a unique addition to the project and would enhance the wildlife mitigation concept.

Response: The addendum accompanying the work plan contains provisions for such a proposal i.e., item 7, page 4, in the Abbreviated Environmental Quality Plan. As will be noted, a sizeable area of wetland would be created under this proposal. This was discussed with the project sponsors during the project formulation stage, and they showed no interest. No other sponsor has been identified that would be willing to obtain the necessary land rights and manage the area.

3) Comment: The report has overlooked the natural floristic wealth of the area and possible impact to a recognized significant natural area was not included in the assessment.

Response: An expanded list of the flora within the watershed has been included on page 22 of the EIS. It is assumed that the recognized significant natural area referred to is the Lye Creek Prairie Burn. The possible adverse effect of the project to this area has been clarified in the response to comment 1.

X. LIST OF APPENDIXES

APPENDIX A - Exhibits

1 - Definition of Conservation Practices and Land Use
2 - Illustrations of Conservation Practices
3 - Illustration of One-Sided Channel Work
4 - Typical Channel Cross-Section
5 - Typical Deflector
6 - Channel Profiles
7A - Estimated Soil Limitations or Suitability for Selected Uses
7B - Key to Exhibits 7A and 7C
7C - General Soil Map
7D - Description of Soil Associations on the General Soil Map
8 - Surficial Geology Map
9 - Surface Water Quality Analyses
10 - Ground Water Quality Analyses
11 - Structure Data - Channels

APPENDIX B - Project Map

APPENDIX C - Comparison of Benefits and Costs for Structural Measures

APPENDIX D - Letters of Comment Received on the Draft Environmental Impact Statement

XI. Approved By: Cletus J. Gillman

Cletus J. Gillman
State Conservationist

Date: March 11, 1975

APPENDIX A - EXHIBITS

Exhibit	1	-	DEFINITION OF CONSERVATION PRACTICES AND LAND USE
"	2	-	ILLUSTRATIONS OF CONSERVATION PRACTICES
"	3	-	ILLUSTRATION OF ONE-SIDED CHANNEL WORK
"	4	-	TYPICAL CHANNEL CROSS-SECTION
"	5	-	TYPICAL DEFLECTOR
"	6	-	CHANNEL PROFILES
"	7A	-	ESTIMATED SOIL LIMITATIONS OR SUITABILITY FOR SELECTED USES
"	7B	-	KEY TO EXHIBITS 7A AND 7C
"	7C	-	GENERAL SOIL MAP
"	7D	-	DESCRIPTION OF SOIL ASSOCIATIONS ON THE GENERAL SOIL MAP
"	8	-	SURFICIAL GEOLOGY MAP
"	9	-	SURFACE WATER QUALITY ANALYSES
"	10	-	GROUND WATER QUALITY ANALYSES
"	11	-	STRUCTURE DATA - CHANNELS

Exhibit 1

DEFINITION OF CONSERVATION PRACTICES AND LAND USE

CONSERVATION PRACTICES

CONSERVATION CROPPING SYSTEM

Growing crops in combination with needed cultural and management measures. Cropping systems include rotations that contain grasses and legumes as well as rotations in which the desired benefits are achieved without the use of such crops.

CONTOUR FARMING

Farming sloping cultivated land in such a way that plowing, preparing and planting, and cultivation are done on the contour. (This includes following established grades of terraces, diversions, or contour strips.)

CROP RESIDUE USE

Using plant residues to protect cultivated fields during critical erosion periods.

DRAINAGE FIELD DITCHES

A shallow graded ditch for collecting water within field, usually constructed with flat side slopes for ease of crossing. (This does not include drainage main or lateral, or grasses waterway or outlet.)

DRAINAGE MAIN OR LATERAL

An open drainage ditch constructed to a designed size and grade. Does not include drainage field ditch.

GRADE STABILIZATION STRUCTURE

A structure to stabilize the grade or to control head cutting in natural or artificial channels. (Does not include structures used in drainage and irrigation systems primarily for water control.)

GRASSES WATERWAY OR OUTLET

A natural or constructed waterway or outlet shaped or graded and established in vegetation suitable to safely dispose runoff from a field, diversion, terrace, or other structure.

MINIMUM TILLAGE

Limiting the number of cultural operations to those that are properly timed and essential to produce a crop and prevent soil damage.

DEFINITION OF CONSERVATION PRACTICES AND LAND USE CONT'D

CONSERVATION PRACTICES CONT'D

PASTURE AND HAYLAND MANAGEMENT

Proper treatment and use of pastureland or hayland.

PASTURE AND HAYLAND PLANTING

Establishing and re-establishing long-term stands of adapted species of perennial, biennial or reseeding forage plants. (Includes pasture and hayland renovation. Does not include grasses waterway or outlet on cropland.)

SUBSURFACE DRAIN

A conduit, such as tile, pipe, or tubing, installed beneath the ground surface and which collects and/or conveys drainage water.

LAND USE

CROPLAND

Cropland includes all cultivated land used for field crops or hay in pasture or rotation; cropland temporarily idle or diverted from production under government programs; permanent hayland; orchards, vineyards and bush fruits; and open land formerly cropped and not converted to another use.

FOREST OR WOODLAND

Forest or woodland includes land that is at least 10% stocked with forest trees and capable of producing forest products or influencing a water regime, land that formerly grew trees and is not currently developed for non-forest use, and land that has been planted to trees.

OTHER LAND

Other land is non-federal rural land which is not classified as cropland, pasture or forest land. It includes strip mines, borrow and gravel pits, farmsteads, farm roads, ditches, rural non-farm residences, and idle, open rural non-farm land.

PASTURE

Pasture includes lands producing forage plants, principally introduced species, primarily for grazing and not included in cropland rotation; includes native pasture and may contain shade or timber trees if canopy is less than 10%.

(Reproduced from SCS Technical Guide Sec. IV and Indiana Soil and Water Conservation Inventory 1968)

Soil loss can be controlled
with conservation practices

Crop residue use saves soil,
slows storm runoff water, and
saves precious fuel.

Contour farming holds soil
and moisture in place.

USDA-SCS-LINCOLN, NEBR. 1974

Wet spots and poor drainage hurts crop production.

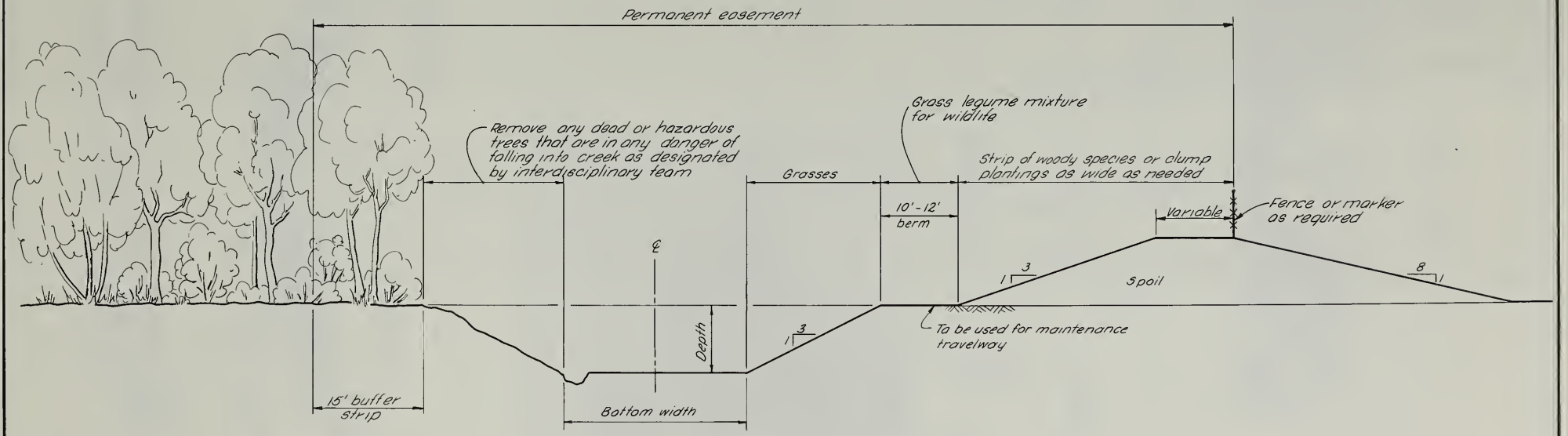
Modern subsurface drains can solve wetness problems.

An outlet ditch with proper depth and capacity.

EXHIBIT 3

Channel work from one side only preserves valuable wildlife habitat.

USDA-SCS-LINCOLN, NEBR. 1974



TYPICAL CHANNEL CROSS SECTION

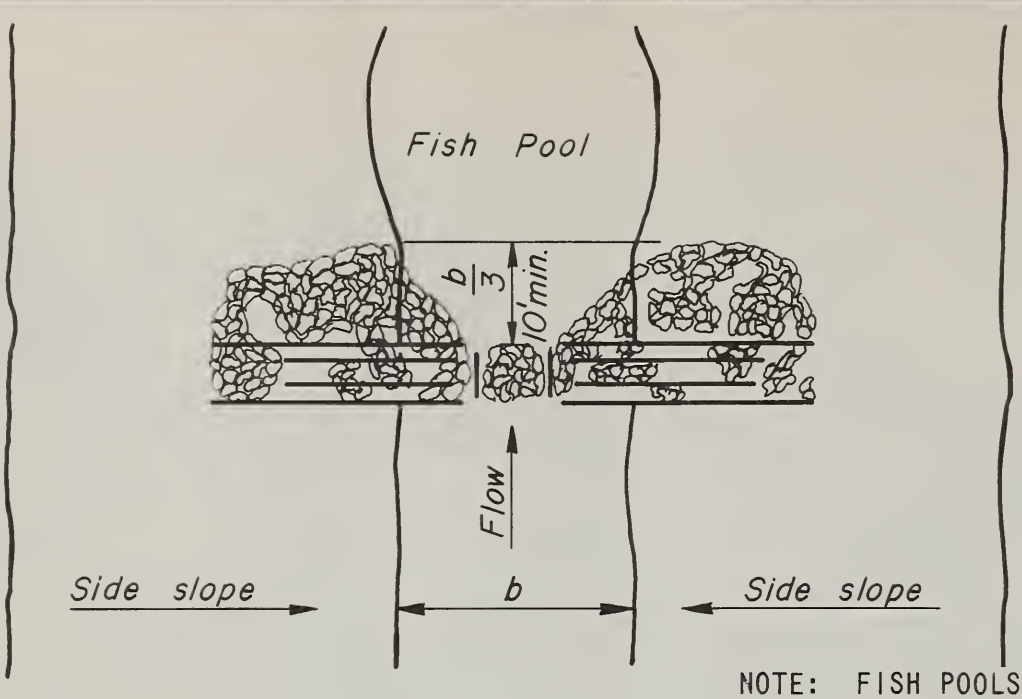
(with berm)

Exhibit 4

5,E-32,984.1

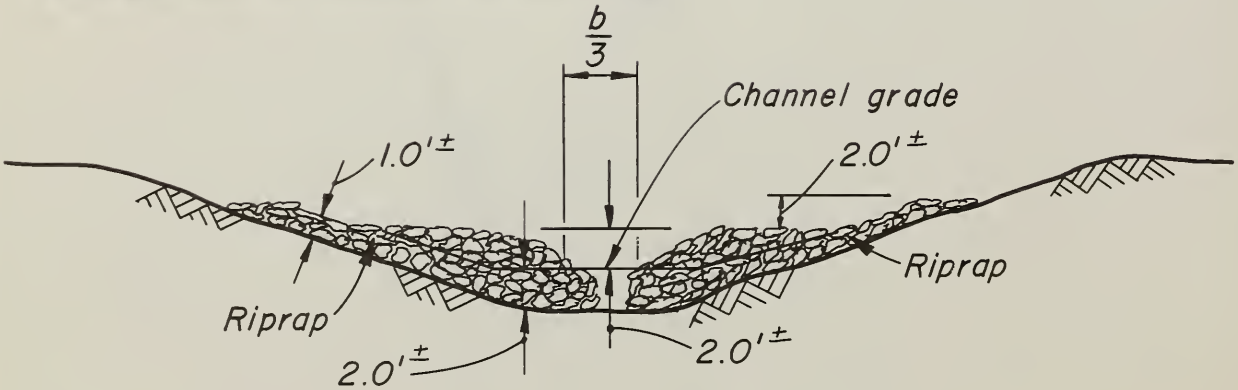
IN-EDU 7-71

USDA-SCS-LINCOLN, NEBR. 1974



PLAN

NOTE: FISH POOLS SHALL BE EXCAVATED DOWNSTREAM OF EACH DEFLECTOR.

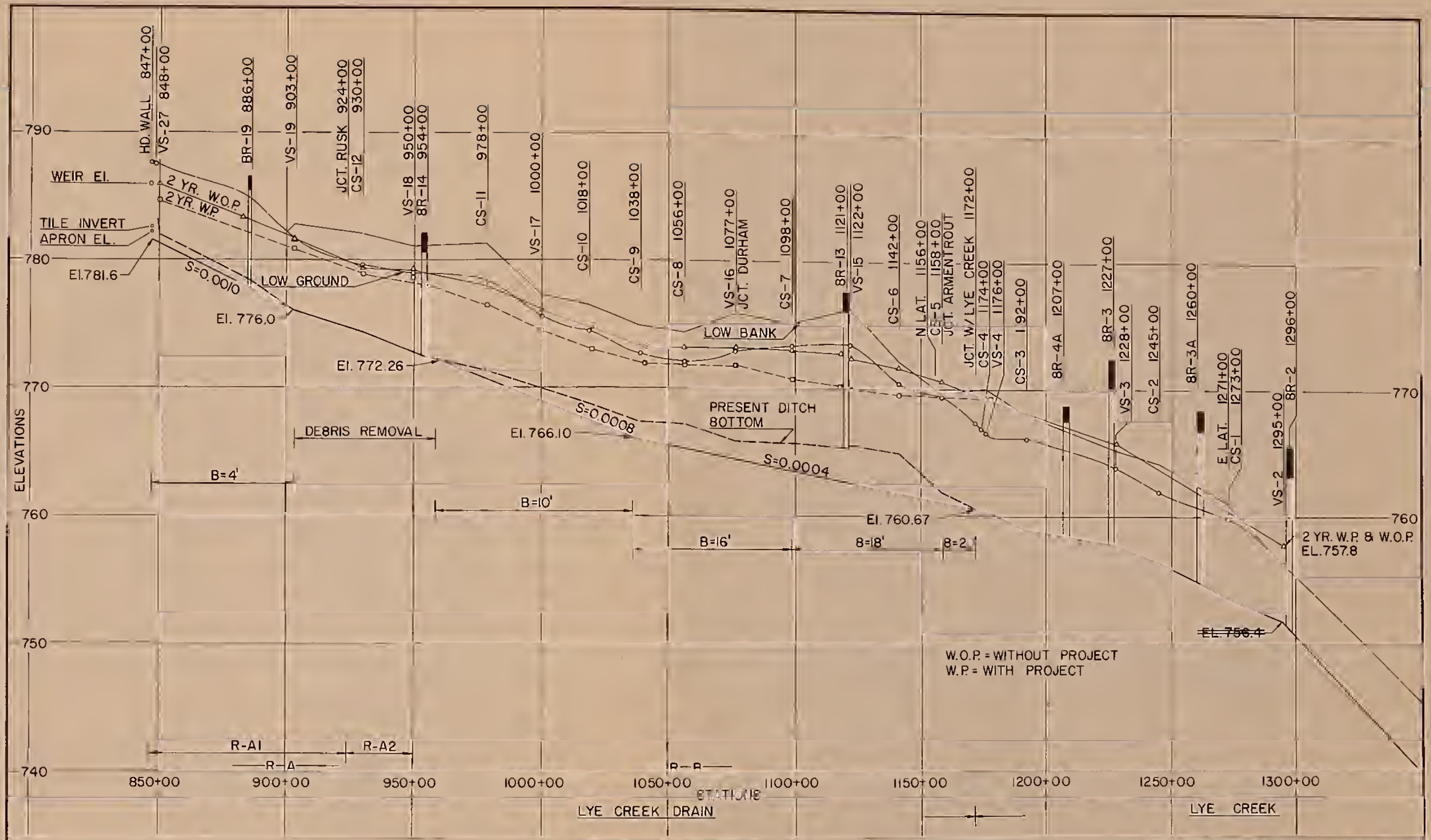


UPSTREAM ELEVATION
TYPICAL DEFLECTOR

Exhibit 5

USDA-SCS-LINCOLN, NEBR. 1974

5,N-32,984.1



LYE CREEK DRAIN W/S

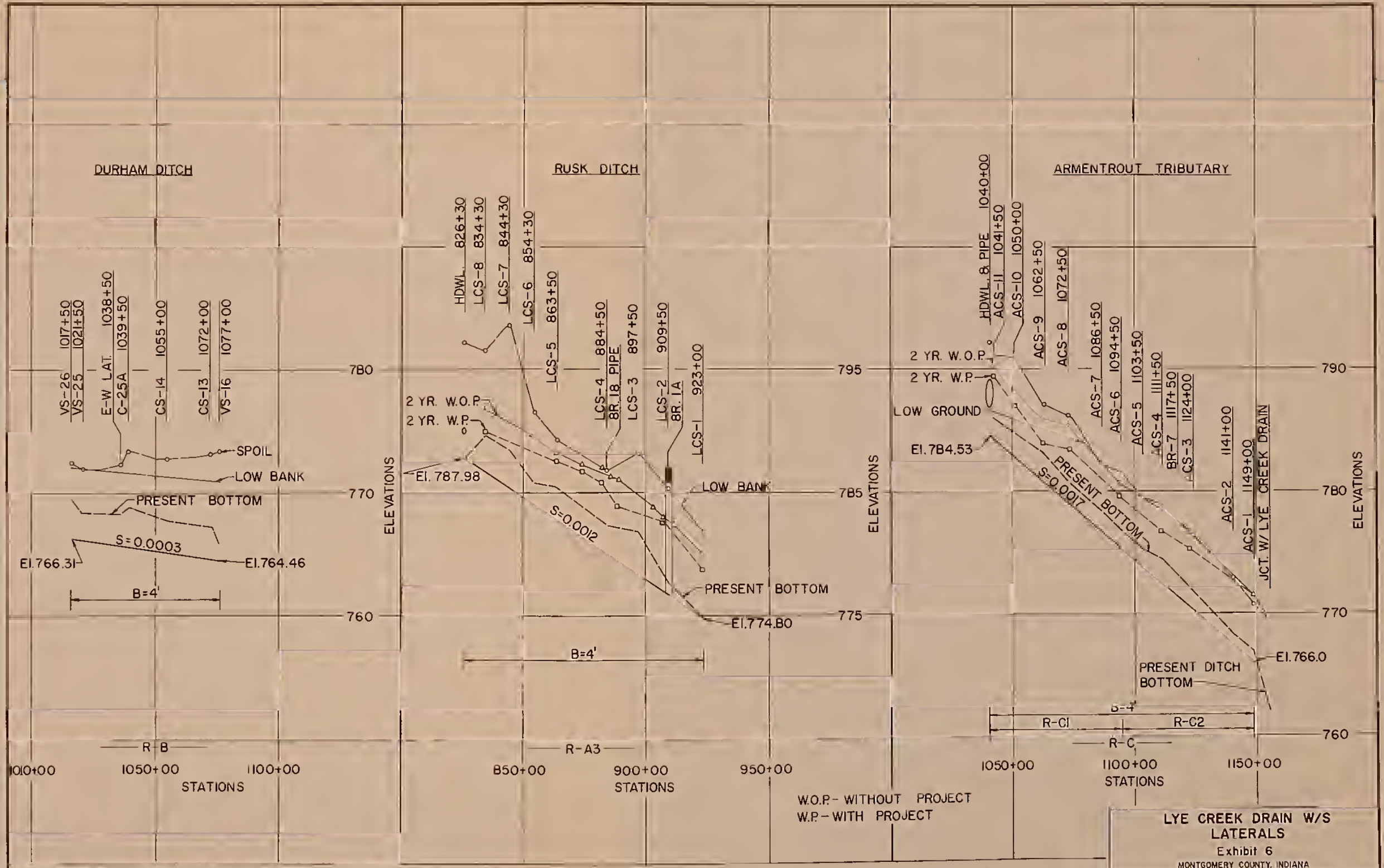
Exhibit 6

MONTGOMERY COUNTY, INDIANA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

	Date		
Designed		Approved by	
Drawn		Title	
Traced		Title	
Checked		Sheet No. 1 of 2	Drawing No. 5,E-32,984.1

Rev 11-27-78



LYE CREEK DRAIN W/S
LATERALS
Exhibit 6
MONTGOMERY COUNTY, INDIANA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

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EXHIBIT 7A

LYE CREEK DRAIN WATERSHED

ESTIMATED SOIL LIMITATIONS OR SUITABILITY FOR SELECTED USES

SOIL ASSN. & % OF WATERSHED	SOIL SERIES & % OF ASSOCIATION		DWELLINGS WITH BASEMENTS	DWELLINGS WITHOUT BASEMENTS	WASTE DISPOSAL SEPTIC TANK ABSORPTION FIELDS	WASTE DISPOSAL SEWAGE LAGOONS	LOCAL ROADS STREETS PARKING AREAS	SUITABILITY AS SOURCE OF SAND	SUITABILITY AS SOURCE OF GRAVEL	SUITABILITY AS SOURCE OF ROAD FILL	RECREATION CAMP AND PICNIC AREAS	RECREATION PLAYGROUNDS & ATHLETIC FIELDS	INTENSIVE CROPPING	WOODLAND PRODUCTIVITY
1 20 %	Westland Ockley Minor	60 30 10	Severe: 3 Slight	Severe: 3 Slight	Severe: 3 Slight	Severe: 3,7 Severe: 7	Severe: 3,5 Moderate: 5	Good Good	Good Good	Good Good	Severe: 3 Slight	Severe: 3 Moderate: 1	Good Good	Fair Good
2 40 %	Mahalasville Fincastle Ragsdale Minor	40 20 5 35	Severe: 3 Severe: 3 Severe: 3	Severe: 3 Moderate: 3 Severe: 3	Severe: 3 Severe: 2,3 Severe: 2,3	Severe: 3,7 Moderate: 3 Severe: 3	Severe: 3 Severe: 5 Severe: 3,5	Poor Unsuited Unsuited	Unsuited Unsuited Unsuited	Poor Poor Poor	Severe: 3 Moderate: 3 Severe: 3	Severe: 3 Moderate: 3 Severe: 3	Good Good Good	Fair Fair Fair
3 18 %	Miami Russell Fincastle Minor	37 13 12 38	Slight Slight Severe: 3	Slight Slight Moderate: 3	Moderate: 2 Moderate: 2 Severe: 2,3	Moderate:1,7 Moderate:1,7 Moderate: 3	Severe: 5 Severe: 5 Severe: 5	Unsuited Unsuited Unsuited	Unsuited Unsuited Unsuited	Poor Poor Poor	Slight Slight Moderate: 3	Moderate: 1 Moderate: 1 Moderate: 3	Good Good Good	Good Good Fair
4 10 %	Muck Minor	64 36	Severe:3,5,6	Severe:3,5,6	Severe: 3	Severe: 3,7	Severe: 3,5	Unsuited	Unsuited	Poor	Severe:3,5,6	Severe:3,5,6	Good	Poor
5 6 %	Miami Crosby Minor	37 27 36	Slight Severe: 3	Slight Moderate: 3	Moderate: 2 Severe: 2,3	Moderate:1,7 Moderate: 3	Severe: 5 Severe: 5	Unsuited Unsuited	Unsuited Unsuited	Poor Poor	Slight Moderate: 3	Moderate: 1 Moderate: 3	Good Good	Good Fair
6 1 %	Ragsdale Raub Minor	44 26 30	Severe: 3 Severe: 3	Severe: 3 Moderate: 3	Severe: 2,3 Severe: 2,3	Severe: 3 Moderate: 3	Severe: 3,5 Severe: 5	Unsuited Unsuited	Unsuited Unsuited	Poor Poor	Severe: 3 Moderate: 3	Severe: 3 Moderate: 3	Good Good	Fair No Data Avail.
7 5 %	Brookston Parr Minor	39 36 25	Severe: 3 Slight	Severe: 3 Slight	Severe: 2,3 Moderate: 2	Severe: 3 Moderate: 7	Severe: 3,5 Moderate: 5	Unsuited Unsuited	Unsuited Unsuited	Poor Fair	Severe: 3 Slight	Severe: 3 Slight	Good Good	Fair No Data Avail.

Key To Principal Soil Limitations: 1. Excessive Slope 2. Slow Permeability 3. Seasonal High Water Table 4. Flood Hazard 5. Poor Stability 6. Adverse Soil Texture 7. Excessive Permeability

EXPLANATION OF COLUMNS IN THE TABLE

SOIL ASSOCIATION:

THE NUMBERS IN THIS COLUMN CORRESPOND WITH THE NUMBERED SOIL ASSOCIATIONS ON THE GENERAL SOIL MAP OF THE WATERSHED. EACH SOIL ASSOCIATION IS NAMED FOR THE MAJOR SOILS. THE PERCENT OF EACH SOIL ASSOCIATION IN THE WATERSHED IS SHOWN.

SOIL SERIES & PERCENT OF ASSOCIATION:

THIS COLUMN SHOWS THE APPROXIMATE PERCENT OF EACH MAJOR SOIL IN EACH ASSOCIATION, AND THE TOTAL PERCENT OF ALL THE MINOR SOILS.

DWELLINGS-WITH BASEMENTS:

RATINGS ARE FOR UNDISTURBED SOILS THAT ARE EVALUATED FOR SINGLE FAMILY DWELLINGS AND OTHER STRUCTURES WITH SIMILAR FOUNDATION REQUIREMENTS. EXCLUDED ARE BUILDINGS OF MORE THAN THREE STORIES AND OTHER BUILDINGS WITH FOUNDATION LOADS IN EXCESS OF THOSE EQUAL TO THREE STORY DWELLINGS. NO SPECIFIC BEARING STRENGTH IS ESTIMATED OR IMPLIED.

DWELLINGS-WITHOUT BASEMENTS:

THE SAME QUALIFICATIONS AS GIVEN ABOVE FOR DWELLINGS--WITH BASEMENTS APPLY HERE EXCEPT THAT SEASONAL HIGH WATER TABLES ARE NOT AS RESTRICTIVE.

WASTE DISPOSAL - SEPTIC TANK ABSORPTION FIELDS:

RATINGS ARE FOR SHALLOW, SUB-SURFACE TILE ABSORPTION FIELDS AND DO NOT INCLUDE ALTERNATIVE SYSTEMS.

WASTE DISPOSAL - SEWAGE LAGOONS:

RATINGS ARE FOR SHALLOW LAKES USED TO HOLD SEWAGE FOR THE TIME REQUIRED FOR BACTERIAL ACTION.

LOCAL ROADS, STREETS, & PARKING AREAS:

RATINGS ARE FOR IMPROVED ROADS AND STREETS HAVING SOME KIND OF ALL-WEATHER SURFACING, COMMONLY ASPHALT OR CONCRETE, AND ARE EXPECTED TO CARRY AUTOMOBILE TRAFFIC ALL YEAR.

SUITABILITY AS A SOURCE OF:

SAND - THIS COLUMN PROVIDES GUIDANCE ABOUT WHERE TO LOOK FOR SAND. SOIL RATED "GOOD" CONTAINS A SOURCE OF CLEAN SAND. "FAIR" INDICATES SAND WITH SOME FINE MATERIAL. "POOR" INDICATES SOME FINE MATERIAL COSTLY TO REMOVE. UNSUITED INDICATES SAND IS NOT AVAILABLE.

GRAVEL - THE PURPOSE OF THIS COLUMN IS TO PROVIDE GUIDANCE ABOUT WHERE TO LOOK FOR GRAVEL. THE EXPLANATION OF THE RATINGS FOR "SAND" (ABOVE) APPLY ALSO TO "GRAVEL".

ROADFILL - REFERS TO SOIL MATERIAL MOVED FROM ITS ORIGINAL LOCATION AND USED IN ROAD CONSTRUCTION. GENERALLY IT SERVES AS THE SUBGRADE OR FOUNDATION FOR THE ROAD. THE WHOLE SOIL, TO A DEPTH OF 6 FEET, IS GIVEN ONE RATING, ASSUMING IT WILL BE MIXED IN HANDLING.

RECREATION — CAMP AND PICNIC AREAS:

RATINGS APPLY TO SOILS TO BE USED INTENSIVELY FOR TENTS AND SMALL CAMP TRAILERS AND THE ACCOMPANYING ACTIVITIES OF OUTDOOR LIVING AND FOR PARK-TYPE PICNIC AREAS.

RECREATION - PLAYGROUNDS AND ATHLETIC FIELDS:

RATINGS APPLY TO SOILS TO BE USED INTENSIVELY FOR PLAYGROUNDS FOR BASEBALL, FOOTBALL, VOLLEYBALL, AND OTHER SIMILAR ORGANIZED GAMES. THESE AREAS ARE SUBJECT TO INTENSIVE FOOT TRAFFIC.

INTENSIVE CROPPING:

THE RATINGS ARE BASED ON THE POTENTIAL PRODUCTIVITY OF SOILS TO PRODUCE SUSTAINED CORN YIELDS UNDER HIGH LEVELS OF MANAGEMENT.

WOODLAND PRODUCTIVITY:

THE RATINGS ARE BASED ON THE POTENTIAL PRODUCTIVITY OF SOILS FOR THEIR PRIMARY ADAPTED SPECIES.

GENERAL SOIL MAP

THE GENERAL SOIL MAP OF THE LYE CREEK DRAIN WATERSHED SHOWS SEVEN MAIN PATTERNS OF SOILS CALLED SOIL ASSOCIATIONS. EACH ASSOCIATION CONTAINS A FEW MAJOR SOILS AND SEVERAL MINOR SOILS, AND IS NAMED FOR THE MAJOR SOILS. THE SOILS IN ONE ASSOCIATION MAY BE IN ANOTHER, BUT IN A DIFFERENT PATTERN.

THE GENERAL SOIL MAP IS USEFUL TO PEOPLE WHO WANT A GENERAL IDEA OF THE SOILS, WHO WANT TO COMPARE DIFFERENT PARTS OF THE WATERSHED OR WHO WANT TO KNOW THE LOCATION OF LARGE TRACTS THAT ARE SUITABLE FOR A CERTAIN KIND OF FARM OR NON-FARM LAND USE. SUCH A MAP IS NOT SUITABLE FOR PLANNING THE MANAGEMENT OF A FARM OR FIELD, OR FOR SELECTING THE EXACT LOCATION OF A ROAD, BUILDING OR SIMILAR STRUCTURE BECAUSE THE SOILS IN ANY ONE ASSOCIATION ORDINARILY DIFFER IN SLOPE, DEPTH, DRAINAGE, OR OTHER CHARACTERISTICS THAT AFFECT MANAGEMENT.

DETAILED SOIL MAPS AND INFORMATION ON SOILS AND SPECIFIC USES IS AVAILABLE FOR MUCH OF THE AREA ENCOMPASSED BY THE WATERSHED FOR THIS DETAILED INFORMATION, PLEASE CONTACT THE FIELD OFFICE OF THE SOIL CONSERVATION SERVICE IN THE INDIVIDUAL COUNTIES CONCERNED.

SOIL INTERPRETATIONS

THE INTERPRETIVE TABLE TO THE LEFT PROVIDES SOIL INTERPRETATIONS FOR 12 SPECIFIC USES FOR EACH OF THE SEVEN SOIL ASSOCIATIONS SHOWN ON THE GENERAL SOIL MAP OF THE LYE CREEK DRAIN WATERSHED. THE APPROXIMATE PERCENT OF THE ASSOCIATION OF EACH MAJOR SOIL AND THE TOTAL PERCENT OF ALL OF THE MINOR SOILS IS GIVEN. ESTIMATED LIMITATIONS OR SUITABILITY FOR EACH OF THE NAMED SOILS FOR EACH OF THE 12 USES IS GIVEN IN TERMS OF SLIGHT, MODERATE, OR SEVERE LIMITATIONS OR GOOD, PAIR, POOR OR UNSUITED SUITABILITY. BESIDE EACH OF THE RATINGS THE LIMITING SOIL PROPERTIES OR FEATURES ARE GIVEN BY LISTING ONE OR MORE NUMBERS. THESE NUMBERS CORRESPOND WITH THOSE LISTED IN THE "KEY TO PRINCIPAL SOIL LIMITATIONS", AT THE BOTTOM OF THE TABLE. SOILS RATED AS SLIGHT ARE ESTIMATED TO HAVE NO PRINCIPAL SOIL LIMITATIONS AND ARE NOT REFERENCED TO THE KEY.

SOIL LIMITATION CLASSES

SOILS RATED AS "SLIGHT" HAVE FEW OR NO LIMITATIONS FOR THE USE. SOILS RATED AS "MODERATE" HAVE LIMITATIONS WHICH REDUCE TO SOME DEGREE THEIR DESIRABILITY WHEN USED FOR THE PURPOSE BEING CONSIDERED. THEY REQUIRE SOME CORRECTIVE MEASURES. SOILS RATED AS "SEVERE" HAVE UNFAVORABLE SOIL CHARACTERISTICS THAT SEVERELY RESTRICT THEIR USE AND DESIRABILITY FOR THE PURPOSE. A SEVERE RATING DOES NOT MEAN THE SOIL CANNOT BE USED FOR A SPECIFIC USE. IT DOES INDICATE PROBLEMS DURING OR AFTER APPLICATION OF THE USE, UNLESS SPECIAL DESIGN, ENGINEERING OR OTHER CORRECTIVE MEASURES ARE USED TO OVERCOME THE LIMITATIONS. COSTS ARE USUALLY GREATER THAN ON SOILS RATED SLIGHT OR MODERATE, AND MANY TIMES COSTS ARE PROHIBITIVE.

SOIL SUITABILITY RATING

"GOOD", "FAIR", "POOR" AND "UNSUITED" ARE TERMS USED TO RATE SOILS AS A SOURCE OF SAND, GRAVEL AND ROADFILL. SOILS RATED AS "GOOD" HAVE QUALITIES SUCH THAT THEY CAN BE CONSIDERED AS A SUITABLE RESOURCE MATERIAL. SOILS RATED "FAIR" HAVE SOME PROBLEMS IN THE MATERIAL THAT MAKE THEM LESS DESIRABLE. SOILS RATED AS "POOR" HAVE PROBLEMS THAT GREATLY LIMIT THEIR SUITABILITY AS A SOURCE. SOILS RATED AS "UNSUITED" ARE PHYSICALLY UNFIT, OR IT IS NOT PRACTICAL TO PROCESS THE MATERIAL.

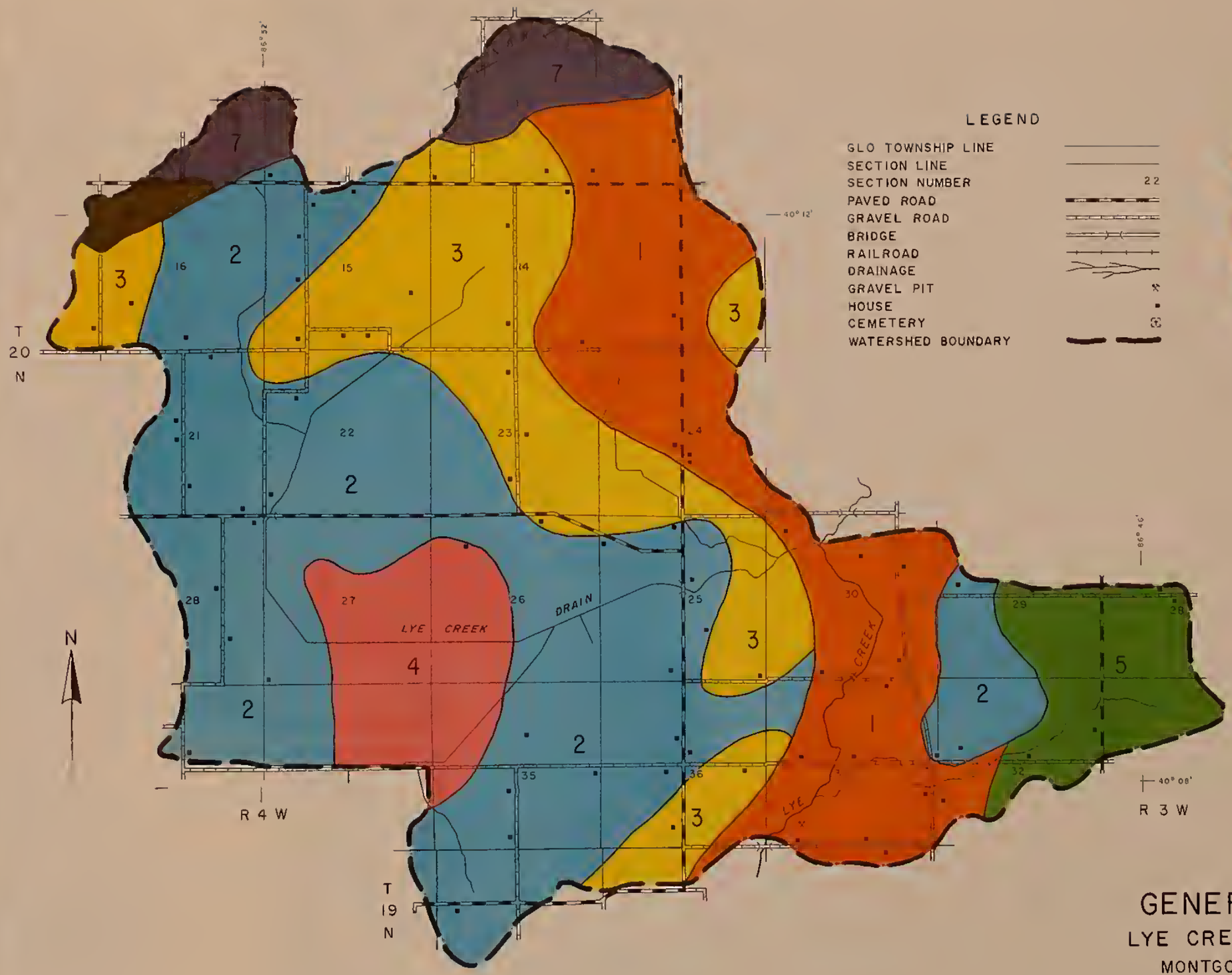
WHERE USED FOR "INTENSIVE CROPPING", "GOOD" INDICATES SOILS ARE CAPABLE OF PRODUCING SUSTAINED CORN YIELDS OF 110 TO 155 BUSHELS OF CORN PER ACRE UNDER HIGH LEVELS OF MANAGEMENT. "FAIR" INDICATES SOILS THAT WILL PRODUCE 70 TO 110 BUSHELS OF CORN AND "POOR" INDICATES THOSE SOILS THAT WILL PRODUCE LESS THAN 70 BUSHELS OF CORN PER ACRE.

WHERE USED FOR "WOODLAND PRODUCTIVITY", "GOOD" INDICATES SOILS ARE CAPABLE OF PRODUCING GREATER THAN 335 BOARD FEET PER ACRE PER YEAR FOR ADAPTED TREE SPECIES. "FAIR" INDICATES SOILS THAT WILL PRODUCE 260 TO 335 BOARD FEET AND "POOR" INDICATES THOSE SOILS THAT WILL PRODUCE LESS THAN 260 BOARD FEET PER ACRE PER YEAR.

USDA SOIL CONSERVATION SERVICE
IN COOPERATION WITH
PURDUE UNIVERSITY
AGRICULTURAL EXPERIMENT STATION

U. S DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE



LEGEND

- GLO TOWNSHIP LINE
- SECTION LINE
- SECTION NUMBER 22
- PAVED ROAD
- GRAVEL ROAD
- BRIDGE
- RAILROAD
- DRAINAGE
- GRAVEL PIT
- HOUSE
- CEMETERY
- WATERSHED BOUNDARY

GENERAL SOILS LEGEND

1. WESTLAND-OCKLEY
2. MAHALASVILLE-FINCASTLE-RAGSDALE
3. MIAMI-RUSSELL-FINCASTLE
4. MUCK
5. MIAMI-CROSBY
6. RAGSDALE-RAUB
7. BROOKSTON-PARR

GENERAL SOILS MAP

LYE CREEK DRAIN WATERSHED

MONTGOMERY COUNTY, INDIANA

SCALE 1/45,000

SCALE 0 SCALE

SOURCE
SCS DRAWING 5,P-30392 AND
INFORMATION FROM FIELD TECHNICIANS.

POLYCONIC PROJECTION

EXHIBIT 7 C

REV 4-1 74
5,P-30393

DESCRIPTIONS OF SOIL ASSOCIATIONS ON THE GENERAL SOIL MAP

The general soil map shows seven soil associations in the watershed. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A description of each soil association on the general soil map follows.

1. Westland-Ockley association: Deep, nearly level and gently sloping, very poorly drained and well drained loamy soils formed in outwash.

Westland soils are nearly level and very poorly drained. Their surface layer typically is very dark brown clay loam about 11 inches in thickness. The subsoil is about 39 inches in thickness. In sequence from the top, the upper part is a dark grayish brown firm clay loam, 10 inches in thickness; the next 24 inches is dark grayish brown firm gravelly clay loam; and the lower 5 inches is dark gray firm gravelly clay loam. The calcareous underlying material, to a depth of about 60 inches, is gray and dark gray stratified sand and gravelly coarse sand.

Ockley soils are gently sloping and well drained. Their surface layer typically is dark grayish brown silt loam about 8 inches in thickness. The subsurface is dark brown friable silt loam about 4 inches in thickness. The subsoil is about 45 inches in thickness. In sequence from the top, the upper part is a dark brown firm silty clay loam and clay loam, 14 inches in thickness; the next 14 inches is dark brown firm gravelly clay loam; and the lower 17 inches is dark reddish brown firm gravelly sandy clay loam. The calcareous underlying material, to a depth of about 60 inches, is a stratified brown sand and gravelly coarse sand.

2. Mahalasville-Fincastle-Ragsdale association: Deep, nearly level and gently sloping, somewhat poorly drained and very poorly drained loamy soils formed in loess and the underlying lacustrine sediments, loess and the underlying glacial till, and loess.

Mahalasville soils are nearly level and very poorly drained. They formed in loess and the underlying lacustrine sediments. Their surface layer typically is a very dark gray silty clay loam about 12 inches in thickness. The subsoil is about 32 inches in thickness. In sequence from the top, the upper part is a gray firm silty clay loam, 27 inches in thickness and the lower part is light gray friable loam, 5 inches in thickness. The

calcareous underlying material, to a depth of about 60 inches, is a stratified light gray fine sand and silt loam.

Fincastle soils are nearly level and somewhat poorly drained. They formed in loess and the underlying glacial till. Their surface layer typically is dark grayish brown silt loam about 8 inches in thickness. The subsurface is grayish brown friable silt loam about 3 inches in thickness. The subsoil is about 39 inches in thickness. In sequence from the top, the upper part is a brown firm silt loam, 3 inches thick; the next 16 inches is grayish brown firm silty clay loam; and the lower 20 inches is brown firm clay loam. The calcareous underlying material, to a depth of about 60 inches, is yellowish brown loam.

Ragsdale soils are nearly level and very poorly drained. They formed in loess. Their surface layer typically is very dark brown silt loam about 15 inches in thickness. The subsoil is about 29 inches in thickness. The upper part is grayish brown firm silty clay loam, 19 inches in thickness and the lower part is yellowish brown firm silty clay loam, 10 inches in thickness. The calcareous underlying material, to a depth of about 60 inches, is light yellowish brown silt loam.

3. Miami-Russell-Fincastle association: Deep, nearly level to moderately sloping, well drained and somewhat poorly drained loamy soils formed in glacial till and loess and the underlying glacial till.

Miami soils are gently sloping or moderately sloping and well drained. They formed in glacial till. Their surface layer typically is a dark grayish brown silt loam about 8 inches in thickness. The subsurface layer is yellowish brown friable silt loam about 4 inches in thickness. The subsoil is dark brown firm clay loam about 22 inches in thickness. The calcareous underlying material to a depth of about 60 inchs, is light yellowish brown loam.

Russell soils are gently sloping or moderately sloping and well drained. They formed in loess and the underlying glacial till. Their surface layer typically is a dark grayish brown silt loam about 10 inches in thickness. The subsoil is about 38 inches in thickness. The upper part is dark yellowish brown firm silty clay loam about 16 inches in thickness. The lower part is yellowish brown firm clay loam about 22 inches in thickness. The calcareous underlying material, to a depth of about 60 inches, is yellowish brown loam.

Fincastle soils are nearly level and somewhat poorly drained. They formed in loess and the underlying glacial till. Their surface layer typically is dark grayish brown silt loam about 8 inches in thickness. The subsurface is grayish brown friable silt loam about 3 inches in thickness. The subsoil is about 39 inches in thickness. In sequence from the top, the upper part is a brown firm silt loam, 3 inches thick; the next 16 inches is grayish brown firm silty clay loam; and the lower 20 inches is brown firm clay loam. The calcareous underlying material, to a depth of about 60 inches, is yellowish brown loam.

4. Muck association: Deep, nearly level, very poorly drained, organic soils formed in organic material and organic material and the underlying loamy glacial drift.

Muck soils are nearly level and very poorly drained. They formed in organic material or organic material and underlying loamy glacial drift. Their surface layer typically is a black muck about 9 inches in thickness. The material underlying the surface layer, to a depth of about 60 inches, is a black and dark reddish brown friable muck or is a black friable muck about 30 inches in thickness underlain by calcareous gray loam.

5. Miami-Crosby association: Deep, nearly level and gently sloping, well drained and somewhat poorly drained loamy soils formed in glacial till.

Miami soils are gently sloping and well drained. They formed in glacial till. Their surface layer typically is a dark grayish brown silt loam about 8 inches in thickness. The subsurface layer is yellowish brown friable silt loam about 4 inches in thickness. The subsoil is dark brown firm clay loam about 22 inches in thickness. The calcareous underlying material to a depth of about 60 inches, is light yellowish brown loam.

Crosby soils are nearly level and somewhat poorly drained. They formed in glacial till. Their surface layer typically is a dark grayish brown silt loam about 9 inches in thickness. The subsurface is a light brownish gray friable silt loam about 2 inches in thickness. The subsoil is 25 inches in thickness. In sequence from the top, the upper part is yellowish brown firm silt loam, 3 inches in thickness; the next 16 inches is yellowish brown firm clay loam; and the lower 6 inches is yellowish brown friable loam. The calcareous underlying material, to a depth of about 60 inches, is a brown loam.

6. Ragsdale-Raub association: Deep, nearly level and gently sloping, very poorly drained and somewhat poorly drained loamy soils formed in loess and loess and the underlying glacial till.

Ragsdale soils are nearly level and very poorly drained. They formed in loess. Their surface layer typically is very dark brown silt loam about 15 inches in thickness. The subsoil is about 29 inches in thickness. The upper part is grayish brown firm silty clay loam, 19 inches in thickness and the lower part is yellowish brown firm silty clay loam, 10 inches in thickness. The calcareous underlying material, to a depth of about 60 inches, is light yellowish brown silt loam.

Raub soils are gently sloping and somewhat poorly drained. They formed in loess and the underlying glacial till. Their surface layer typically is a very dark brown silt loam about 13 inches in thickness. The subsoil is about 30 inches in thickness. In sequence from the top, the upper part is dark grayish brown friable silty clay loam, 5 inches in thickness; the next 17 inches is yellowish brown firm silty clay loam; and the lower 8 inches is yellowish brown friable clay loam. The calcareous underlying

material, to a depth of about 60 inches, is yellowish brown and gray loam.

7. Brookston-Parr association: Deep, nearly level and gently sloping, very poorly drained and well drained loamy soils formed in glacial till.

Brookston soils are nearly level and very poorly drained. They formed in glacial till. Their surface layer typically is very dark gray silty clay loam about 14 inches in thickness. The subsoil is about 32 inches in thickness. In sequence from the top, the upper part is a dark gray firm silty clay loam, 6 inches in thickness; the next 20 inches is a gray firm clay loam; and the lower 6 inches is yellowish brown firm clay loam. The calcareous underlying material, to a depth of about 60 inches, is brown loam.

Parr soils are gently sloping and well drained. They formed in glacial till. Their surface layer typically is very dark brown silt loam about 11 inches in thickness. The subsoil is dark yellowish brown firm clay loam about 20 inches in thickness. The calcareous underlying material, to a depth of about 60 inches, is very pale brown and yellowish brown loam.

U. S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

LEGEND

GLO TOWNSHIP LINE	
SECTION LINE	
SECTION NUMBER	22
PAVED ROAD	
GRAVEL ROAD	
BRIDGE	
RAILROAD	
DRAINAGE	
GRAVEL PIT	
HOUSE	
CEMETERY	
WATERSHED BOUNDARY	

GENERAL SURFICIAL GEOLOGY LEGEND

- OUTWASH
- KAMES AND ESKERS
- MOSTLY GROUND MORAINE
- MUCKS AND PEATS
- VALLEY TRAIN DEPOSITS
- MOSTLY RECENT ALLUVIUM
- MOSTLY END MORAINE

INDIANA

GENERAL SURFICIAL GEOLOGY MAP

LYE CREEK DRAIN WATERSHED

MONTGOMERY COUNTY, INDIANA

SCALE 1/45,000

SCALE 1 0 SCALE 2

Exhibit 3

SOURCE:
SCS DRAWING D, P-30392 AND THE
DANVILLE 1°X2° GEOLOGIC MAP, IDNR, IGS, 1966

POLYCONIC PROJECTION

3-4-74
5,S-32,976

SURFACE WATER QUALITY ANALYSES - APRIL 24, 1974

Site	Site Description	Discharge (cfs)	W. Temp. (°C)	SC (umhos)	DO (mg/1)
1	Lye Creek Drain @ Rd 900N, sandy bottom, many fish & minnows	1.6	14.5	610	13.6
2	Rusk Ditch @ Rd 900N, sand-mud bottom, fish or minnows not seen	.8	14.0	580	10.8
3	Rusk Ditch @ Rd 200E, sandy bottom, many fish and minnows	1.2	13.5	540	11.2
4	Lye Creek Drain @ Rd 800N, mud bottom, some fish and minnows	5.6	11.0	580	12.0
5	Durham Ditch @ Rd 650N near center of sec. 34, low-lying ditch draining muck area	.1	20.0	870	
6	6-inch tile drain outletting into Lye Creek Drain just upstream of Rd 450E	.1	10.5	480	7.9
7	Lye Creek Drain @ Rd 450E, sand-mud bottom with algal growth and iron oxide deposits, some minnows	9.6	11.5	750	15.6
8	Armentrout Tributary @ Rd 900N, spillway and tile drain outlet, thick grass in downstream flow	.3	11.5	650	7.6
9	6-inch tile drain outletting into Armentrout Tributary just above Rd 450E	.1	10.0	600	6.7
10	Armentrout Tributary @ Rd 450E, sandy bottom with much periphyton, some minnows	.9	15.5	610	15.9
11	Lye Creek @ Rd 800N, sandy bottom		13.5	560	14.4
12	24-inch tile drain outletting into Armentrout Drain just above Rd 650N in eastern part of sec. 31	1.3	9.5	620	8.1
13	Armentrout Drain just above Rd 650N near center of sec. 31, sandy bottom with much periphyton, 400' downstream from site 12	1.3	11.5	610	11.4
14	Lye Creek @ Rd 600N, cobble bottom with much periphyton		12.5	590	14.5

SUMMARY OF LYE CREEK DRAIN WATER-QUALITY DATA COLLECTED ON APRIL 30, 1974

Site	3	4	6	7	9	10	11	12
Drainage area (square miles)	2.38	7.84	---	14.3	---	1.69	56.3	1.54
Time	1745	1645	1515	1500	1415	1400	1245	1130
Discharge (cfs)	1.1	3.8	.03	6.2	.01	1.0	30	.9
Water temp.(°C)	14.0	15.0	10.0	15.0	10.0	15.0	16.0	8.0
pH, Field	7.4	8.0	7.5	8.4	7.5	8.0	8.1	7.3
Specific Conductance (umhos)	610	615	525	640	630	650	570	650
Dissolved oxygen	10.6	14.6	8.5	18.0	9.0	14.1	13.0	9.9
Calcium	85	85	76	92	87	88	77	87
Magnesium	26	29	26	30	28	31	27	29
Potassium	.9	.8	.4	.9	.7	.7	1.0	1.0
Sodium	4.4	5.4	3.8	6.7	4.2	4.6	5.8	4.2
Bicarbonate	302	308	308	311	274	304	288	312
Carbonate	0	0	0	6	0	0	0	0
Chloride	15	14	5.7	16	19	23	15	14
Fluoride	.6	.6	.5	.6	.6	.4	.4	.4
Sulfate	53	56	37	72	52	45	43	49
Silica dioxide	9.3	9.3	9.6	8.1	9.4	6.4	2.1	10
Dissolved solids	357	364	317	398	368	381	332	367
Total alkalinity (as $CaCO_3$)	248	253	253	265	225	249	236	256
Total hardness (as $CaCO_3$)	320	330	300	350	330	350	300	340
Noncarbonate hardness (as $CaCO_3$)	72	79	44	88	110	98	67	81
Ammonia, dissolved (as N)	0.10	0.04	0.04	0.05	0.04	0.05	0.08	0.07
Organic nitrogen, dissolved (as N)	.66	.44	.31	.51	.30	.33	.40	.25
Kjeldahl nitrogen, dissolved (as N)	.76	.48	.35	.56	.34	.38	.48	.32
Nitrite, dissolved (as N)	.03	.02	.01	.02	.01	.04	.03	.01
Nitrate, dissolved (as N)	3.0	2.7	1.4	2.7	7.3	7.2	4.1	4.1
Orthophosphate, dissolved (as P)	.01	.01	0	.01	.01	0	0	.02
Phosphate, dissolved (as P)	.05	.05	.04	.05	.05	.03	.03	.05
Organic carbon, dissolved		3.0	1.5	3.6				1.4
Aluminum, total		.40	.10	.30				.20
Iron, total		.71	.06	.49				.46
Iron, dissolved	.07	.23	.04	.06	.03	.02	.23	.14
Manganese, total		.10	.20	.13				.04
Manganese, dissolved	.17	.07	0	.07	0	0	.02	.02
Fecal coliform*	231	180		85		100	190	180
Fecal streptococci*	430	460		430		100	220	1300

milligrams per litre

*Colonies per 100 millilitres

Exhibit 9 Cont'd

SUMMARY OF AVAILABLE GROUND-WATER QUALITY ANALYSES

(All figures ppm unless otherwise labeled.)

20-3-31	20-4-8	20-4-11	20-4-21	20-4-21	20-4-23	20-4-27	20-4-33	20-4-36	LOCATION T-R-S
(4)	(2)	(3)	(3)	(2)	(3)	(2)	(2)	(4)	AQUIFER
	7.5								pH
63		55			56	54	60	55	T (°F)
	5								COLOR (S.U.)
	2								TURBIDITY (S.U.)
	332								HARDNESS ($CaCO_3$)
444		328	204	372	288	324	372	204	HARDNESS ($CaMgCO_3$)
581		503	517	483	464	434	444	483	BICARBONATE (HCO_3)
	70								CALCIUM (Ca)
	38								MAGNESIUM (Mg)
	26								SODIUM (Na)
	3								POTASSIUM (K)
>7.5	1.8	2.5	1.0	3.0	0.8	7.5	3.0	0.2	IRON (Fe)
	0								MANGANESE (Mn)
	358								ALKALINITY ($CaCO_3$)
22	8	6	24	5	6	6	4	4	CHLORIDES (Cl)
	10		12						SULFATES (SO_4)
	0.1								NITRATES (N)
	0.7								FLUORIDES (F)
	Linden PWS						Gas in water		REMARKS

Sources: "Data on Indiana Public Water Supplies"
"Ground-Water Resources of West-Central Indiana, Bull. 27"

STRUCTURAL DATA

CHANNELS

Lye Creek Drain Watershed, Indiana

Channel Name and Reach	Station	Drainage Area Sq. Mi.	Required Capacity cfs.	Channel Dimensions 1/ Bottom Width	Bottom Grade	Depth 2/ of Flow	"n" Value Aged	"n" Value As Built	Velocities ft./sec. Aged	Velocities ft./sec. As Built	Excavation Cu.-Yds.	Type 3/ of Work	Before Project Type of Channel 4/	Before Project Flow Condition 5/
Lye Creek Drain A	847+00 903+00	3.3	175	4	0.10	4.9	0.040	0.025	2.57	3.41	3000	II	M	I
	903+00 959+24	6.4	240	DEBRIS REMOVAL				-				IV	M	I
B	959+24 1036+18	8.5	330	10	0.08	5.7	.040	0.025	2.90	3.73		II	M	I
	1036+18 1098+00	10.9	440	16	0.04	6.4	.035		2.63	3.06		II	M	I
	1098+00 1158+00	12.2	460	18	0.04	6.3	.035		2.56	3.05		II	M	I
	1158+00 1172+00	15.0	520	20	0.04	6.5	.035		2.64	3.24	110000	II	M	I
Rusk Ditch A	826+30 909+50	2.7	120	4	0.12	4.0	.040		2.64	3.13	16000	II	M	I
	909+50 923+00		120	4	0.26	3.4	.040		3.57	4.30		II	M	I
Durham Ditch B	1017+50 1077+00	3.0	80	4	0.03	4.5	.040		1.38	2.19	19000	II	M	I
Armentrout Tributary C	1040+00 1150+00	2.8	150	4	0.17	4.0	.040		3.25	3.96	16000	II	M	I
	1150+00 1156+00			4	0.8	2.9	.040		5.83	5.35		II	M	I

1/ Side slopes on constructed side are 3:1 and on unconstructed side are approximately 2:1.

2/ Depths shown are normal depths for the capacity required. Backwater does affect Reach B.

3/ II - Enlargement or realignment of existing channel or stream.

4/ M (1944) - Manmade ditch or previously modified channel.

5/ I - Intermittent - continuous flow through some seasons of the year but little or no flow through other seasons.

6/ Velocity Aged is based on the 100 yr. Q while the As Built is based on 10 yr. Q.

March 1975

EXHIBIT 11

COMPARISON OF BENEFITS AND COSTS FOR STRUCTURAL MEASURES

Lye Creek Drain Watershed, Indiana
(Dollars)

Evaluation Unit	Average Annual Benefits 1/						
	Reduction	More Intensive Land Use	Drainage	Secondary	Total	Average Annual Cost	Benefit Cost Ratio
All Structural Measures	6,760	19,840	17,700	10,180	54,480	27,640	2.0:1
Project Administration	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx					3,820	xxxxxxxxxxx
GRAND TOTAL	6,760	19,840	17,700	10,180	54,480	31,460	1.7:1

1/ Price Base: current normalized - Water Resources Council, February, 1974.

March 1975

OHIO RIVER BASIN COMMISSION

Suite 208-20
Cincinnati, Ohio 45202

36 East Fourth Street
513/684-3831 (FTS)

November 8, 1974

Mr. Cletus J. Gillman
Member, ORBC
Soil Conservation Service
Atkinson Square West-Suite 2200
5610 Crawfordsville Road
Indianapolis, Indiana 45224

Dear Mr. Gillman:

This is in regard to your letter of September 16, 1974 requesting comments on the Draft Environmental Impact Statement and Work Plan for Watershed Protection and Flood Prevention, Lye Creek Drain Watershed, Montgomery County, Indiana (Draft).

Pursuant to Commission policy ORBC members and alternates were notified of your request on September 18, 1974. We have received no response on the subject and therefore conclude that the EIS and Work Plan were properly coordinated with Ohio River Basin Commission members (1) However, it should be noted that the Atomic Energy Commission and the Department of Housing and Urban Development were not listed as agencies from which written comments were requested, as shown on page 2 of the Draft EIS.

As noted on page 24, the Corps of Engineers has a multipurpose reservoir on Sugar Creek (Crawfordsville Lake) located about three miles downstream from the confluence of Lye Creek with Sugar Creek. This structure, if installed, would cause a backwater condition during flood stage. It should also be noted that neither the SCS Lye Creek Watershed Project nor the Corps of Engineers Crawfordsville Lake Project have been adopted as part of the Ohio River Basin Commission Comprehensive Coordinated Joint Plan for the Wabash Basin nor have they been rejected, presently these projects are listed as Action Pending. However, in view of the Corps of Engineers announcement of termination of the investigation on Crawfordsville Lake, April 17, 1974, and unless indicated otherwise to you by Commission members representing the State of Indiana, the Wabash Valley Interstate Commission or the Corps of Engineers, the proposed action is considered to be compatible with the ORBC CCJP as it exists today. In fact it is an indication that Lye Creek is the selected alternative.

(2) In keeping with the ORBC adopted definition of the CCJP it is suggested that the parenthetical expression at the bottom of page 24 be changed to read as

follows: (The Lye Creek Drain Watershed Project is being considered for inclusion in the Wabash major portion of the Comprehensive Coordinated Joint Plan being developed by the Ohio River Basin Commission. Adoption of the project as part of the CCJP is expected prior to completion of the Final Work Plan and Environmental Impact Statement).

Thank you for your consideration and cooperation.

Sincerely,

Fred E. Morr

Fred E. Morr
Chairman

cc: Joseph D. Cloud
George D. Gettinger
BG Wayne S. Nichols

DEPARTMENT OF THE ARMY
WASHINGTON, D.C. 20310

Honorable Robert W. Long
Assistant Secretary of Agriculture
Washington, D. C. 20250

Dear Mr. Long:

In compliance with the provisions of Section 5 of Public Law 566, 83d Congress, the State Conservationist, on behalf of the Administrator of the Soil Conservation Service, by letter dated 16 September 1974, requested the views of the Secretary of the Army on the Watershed Work Plan and Draft Environmental Statement for the Lye Creek Drain Watershed, Indiana.

We have reviewed the work plan and foresee no conflict with any projects or current proposals of this Department. The draft environmental statement is considered to be generally satisfactory.

Sincerely,

Charles R. Ford
Chief
Office of Civil Functions

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
REGION V
300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606

OFFICE OF
THE REGIONAL DIRECTOR

November 18, 1974

Mr. Cletus J. Gillman
State Conservationist
Soil Conservation Service
U.S. Department of Agriculture
5610 Crawfordsville Road, Suite 2200
Indianapolis, Indiana 46224

RE: Draft Environmental Impact Statement
Lye Creek Drain Watershed
Montgomery County, Indiana

Dear Mr. Gillman:

We have reviewed the Draft Environmental Impact Statement for the above project. To our knowledge, and based upon the information provided, this project will not impact to any significant degree on the health, education or welfare of the population.

Sincerely yours,

Robert A. Ford

Robert A. Ford
Regional Environmental Officer

cc: Charles Custard, OEA
Warren Muir, CEQ

United States Department of the Interior

OFFICE OF THE SECRETARY
NORTH CENTRAL REGION
536 SOUTH CLARK STREET
CHICAGO, ILLINOIS 60605

(ER-74/1185)

November 12, 1974

Mr. Cletus Gillman
State Conservationist
Soil Conservation Service
5610 Crawfordsville Road
Indianapolis, Indiana 46224

Dear Mr. Gillman:

Thank you for your letter of September 16, 1974, requesting our views and comments on a work plan and draft environmental statement for the Lye Creek Drain Watershed, Montgomery County, Indiana. We have completed our review of these two documents and will provide you with some comments common to both the draft work plan and environmental statement, followed by comments unique to the draft environmental impact statement.

(1) On Work Plan page 6, (Abbreviated Environmental Quality Plan) first paragraph under the heading Biological resources and selected ecosystems, the term "stream improvement" should be clarified to avoid possible confusion. Although the term as used means improvement of fishery habitat through artificial riffles and pools, the same term often is applied to channelization or stream cleanout.

WATERSHED RESOURCES-ENVIRONMENTAL SETTING

(2) Page 5 of the Work Plan and page 14 of the environmental impact statement (EIS) should mention the presence of a number of small Type I wetlands in the wooded floodplain along Lye Creek.

(3) The first complete paragraph on page 6 of the Work Plan describes Durham Ditch, but it does not mention that the water level is controlled by pumping rather than gravity flow. There also is no mention of a large new lateral ditch paralleling Lye Creek Drain and joining Durham Ditch at the pumping station about ½ mile below 650N Road. We suggest that these items be included in the Work Plan and EIS.

(4) Plant and animal resources - Work Plan page 13 and EIS page 21 refer to U. S. Forest Service information indicating that present forest stands consist of soft maple-ash, river birch-cottonwood, and walnut-ash. Locations of these stands within the watershed should be given since

we are not aware of their presence in the percentages given. To our knowledge, the majority of the upland woodlots are oak-hickory, but this forest type is not included in the percentages.

(5) Paragraph three on Work Plan page 13 and the equivalent paragraph on EIS page 22, are not entirely accurate. We agree that woody habitat is not extensive along the four drains where project activity is proposed; however, there are some wooded areas on the ditch banks that are important to wildlife. Although the narrowness and limited length of these wooded areas reduces their importance to large mammals such as white-tailed deer, they are inhabited by small mammals, birds, reptiles, and amphibians. Excellent food and cover plants such as black cherry, mulberry and blackberry predominate in these areas, making them extremely important to wildlife, especially since the majority of the watershed is in row crops which provide only limited habitat value. The woodlands along Lye Creek and lower Armentrout Drain are not limited to narrow strips along the channels but may extend 0.1 mile or more back from the streambank. These woodlands and many of the upland woodlots contain excellent compositions of species and sizes of trees. The woodlands that are not grazed and some that are lightly grazed contain high quality wildlife habitat, including food and cover.

In addition to the wet woodlands along Lye Creek, there is a small wetland in the woods at the corner of 900N and 225E Roads. The high population of muskrats in the watershed sould be noted as well as the fact the harriers and kestrels also are found in the area.

(6) Archaeological, historical and unique scenic resources (page 16): No established or studied unit of the National Park System or any registered National Landmark would be adversely affected by the proposal. However, a site known as Lye Creek Prairie Burn, located in Sections 34 and 35, T19N, R4W, may lie within the project area. This site has been described by Dr. A. A. Lindsey of Purdue University as a sixty-acre remnant of wet prairie that has been pastured but never touched by farm machinery. A fire during the drought year of 1935 consumed the soil on about half of this sixty acre site to a depth of as much as three feet. While it is doubtful that this site will be studied as a National Natural Landmark, it may have state significance.

WATER AND RELATED LAND RESOURCE PROBLEMS

(7) Floodwater damage (page 19): The average number of floods during the cropping season should be indicated.

PROJECT FORMULATION

(8) There should be a discussion in both the Work Plan and in the Alternatives section of the EIS, of the alternative of limited clearing on the construction

side. This would involve leaving large trees and clumps of trees and shrubs valuable to wildlife along the ditches and working around them, with the maintenance lane constructed back from the bank. The adverse environmental impact, cost of mitigation, and the time lag between construction and establishment of cover could thus be lessened.

WORKS OF IMPROVEMENT TO BE INSTALLED

Structural measures - The second paragraph on page 30 states that armor plating will be used where necessary. The approximate locations and extent of this plating should be provided in both the Work Plan and EIS.

The second paragraph on page 31, concerning land easements, needs additional information for clarification. Apparently, the figures given for acres of cropland, woody areas and channel area in the permanent easement refer to the without-the-project situation, but the with-the-project figures for land use also should be given here, and on page 40 of the EIS.

EFFECTS OF WORKS OF IMPROVEMENT

The bottom paragraph on page 36 mentions that 5.1 miles of ditches will be widened and deepened, but the summary on page 1 states that work will be done on 11.3 miles of drainage channels, with deepening and enlargement for 10.2 miles and debris removal for 1.1 miles. These inconsistencies should be corrected here, and on pages 5 and 34 of the EIS.

ENGINEERING

The fourth paragraph on page 50 discusses one-side-only clearing. It should be explained why in Reach B the channel will be constructed from the side opposite the existing spoil bank, because the bottom paragraph on page 30 states that the existing spoil banks along Lye Creek Drain and Durham Ditch will be repaired to provide additional protection.

The first paragraph on page 51 of the Work Plan should indicate how marking of the permanent easement-lands will be accomplished, i.e., the type and placement of markers to ensure the exclusion of farming operations and equipment. It is important that the markers be large enough to easily be seen and close enough together to prevent ingress by farm machinery. Page 6 of the environmental impact statement should also contain this information.

ADDITIONAL ENVIRONMENTAL IMPACT STATEMENT COMMENTS

III. PROJECT IDENTIFICATION AND ENVIRONMENTAL SETTING

We consider the statement adequate with regard to mineral resources and foresee no significant impact on these resources.

(14) The first paragraph on page 19 states that evidence of chlordane and DDD and significant amounts of dieldrin have been found in the bottom samples of Lye Creek Drain. Since the bottom will be disturbed by project activity, the impact statement should address the pesticides problem in much greater detail. For example, will pesticides be washed downstream to affect water quality and therefore fish and wildlife? Will using polluted bottom material on spoil banks re-introduce pesticides to the food chain and thus adversely affect wildlife resources?

(15) Page 25 states that installation of the project will not encroach on any known archaeological values, any historic place or any planning by the Indiana Department of Natural Resources for historic preservation. We suggest that the statement reflect contact with the State Historic Preservation Officer, who is the Director of the Department of Natural Resources. We assume that the archaeological survey of the Lye Creek Drain Watershed cited on page 25 was an intensive survey of all areas which would be affected as a result of construction and land modification practices; however, this point should be clarified to remove all doubt.

V. ENVIRONMENTAL IMPACT

(16) A. Conservation land treatment - The final paragraph on page 33 states that 68 acres of forest land will receive treatment, while the summary on page 1 says that 58 acres of forest land will be managed. This inconsistency should be corrected.

(17) B. Structural measures - A discussion on expected land use changes and their impact should be included. The list of adverse environmental effects on page 37 indicates that 154 acres of grassland and 137 acres of idle land will be changed to cropland and forest; however, we do not believe it is sufficient to list changes without addressing the impacts of these changes. For example, where are the 291 acres that will undergo land use changes located? What is their value to the wildlife of this watershed? Which species of wildlife will be most affected by the changes? Are any secondary effects anticipated, such as timber clearing because of better drainage?

(18) How many farm units will benefit from the project? On page 34 it is stated that 35 will benefit, while on page 36, 50 farm units are said to benefit.

(19) E. Adverse environmental effects - Actual effects and impacts need to be discussed. For example, actual impacts to the fishery will be loss of a stable bottom and bottom habitat through dredging, loss of shade because of tree cutting, and an increase in water temperature due to decreased water depth and bank shade.

VI. ALTERNATIVES

(20) Additional information should be provided for each of the alternatives

mentioned. For example, actual mileages of channel to accompany pumping should be given. The alternative of deepening only should be discussed, along with sufficient information to adequately evaluate this alternative.

As was mentioned earlier, the alternative of limited clearing on the construction side should be evaluated.

VII. SHORT-TERM vs. LONG-TERM USE OF RESOURCES

(27) On page 40, is the conversion of 291 acres of grassland and idle land to cropland and forest land as a result of the project consistent with expected without-the-project trends?

Sincerely,

Madonna F. McGrath

Madonna F. McGrath
Acting Special Assistant
to the Secretary

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

MAILING ADDRESS:
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400 SEVENTH STREET SW.
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NOV 13 1974

Mr. Cletus J. Gillman
State Conservationist
Soil Conservation Service
5610 Crawfordville Road
Indianapolis, Indiana 426224

Dear Mr. Gillman:

This is in response to your letter of 16 September 1974 addressed to Commandant, U.S. Coast Guard concerning a draft environmental statement for the Lye Creek Drain Watershed Project, Montgomery County, Indiana.

The Department of Transportation has reviewed the material submitted. We have no comments to offer nor do we have any objection to this project.

The opportunity to review this draft statement is appreciated.

Sincerely,

R. I. PRICE
Rear Admiral, U. S. Coast Guard
Chief, Office of Marine Environment
and Systems

U.S. Environmental Protection Agency
Region V
230 South Dearborn
Chicago, Illinois 60604

NOV 13 1974

Mr. Cletus J. Gillman
State Conservationist
United States Department of Agriculture
Soil Conservation Service
3610 Crawfordsville Road, Suite 2200
Indianapolis, Indiana 46224

Dear Mr. Gillman:

We have reviewed the Draft Environmental Impact Statement (EIS) and the Draft Work Plan for the Lye Creek Drain Watershed, Montgomery County, Indiana dated September 16, 1974. We have classified our comments as Category LO-2. Specifically, this means we have no major objections to the project, however, we believe more information should be provided in the Final EIS to adequately assess the environmental impact of the proposed action. This classification and the date of our comments will appear in the Federal Register in accordance with our responsibility to inform the public of our views on Federal actions under Section 309 of the Clean Air Act. We offer the following comments for inclusion in the Final EIS.

(1) The discussion of water quality which begins on page 17 of the EIS should be expanded. Problems from septic tank seepage should be discussed and feedlots that present potential water quality problems should be identified. Also, an expanded discussion of water quality should include the complete Indiana Department of Natural Resources Survey Report on Lye Creek.

(2) The re-suspension of sediments during dredging and subsequent maintenance dredging will adversely affect water quality. The extent of the water quality effects will be determined by the physical and chemical characteristics of the bottom sediments, the type of dredging operation, and the amount of stream flow. Adverse effects on water quality could be minimized if dredging occurred during low flows. The placement of dredge spoil could effect water quality from the leaching of pollutants and erosion of the spoil banks. The EIS should discuss the physical and chemical characteristics of the spoil and utilize this information to prevent unnecessary water quality degradation resulting from placement or inadequate containment of polluted spoil. Also, environmental considerations should be made as specific as possible to the contractor and periodic inspections during construction should be made to be assured that environmental damage from construction activity is minimized.

(3) The impacts of the project along reach D and lower reaches could be of major importance. The EIS should discuss in greater detail the project's effects upon increased floodstages and potential downstream damages from flooding.

Regarding the Draft Work Plan for the project, we offer the following comments:

1. Problems such as septic tank seepage, and feedlot wastes mentioned on page two, paragraph five should be fully explained. Any future plans for regionalization of wastewater treatment facilities should be discussed.

2. Information provided on page nine of the Work Plan could be greatly improved with further elaboration. The water quality information presented is quite general making an objective appraisal difficult.

3. Land treatment measures proposed for the project will in general dictate the success or failure of the prescribed project objectives. Therefore, if possible, further assurances or binding commitments should be obtained from landowners in the project area.

Finally, we think it would be appropriate to include a discussion in the Final EIS which would specify any changes or modifications in the proposed project resulting from comments submitted on the Draft EIS. Thank you for the opportunity to comment on the proposal. Please note all future correspondence with our Regional Office should be mailed to our new address.

Sincerely yours,

Donald A. Wallgren

Donald A. Wallgren
Chief,
Federal Activities Branch

Advisory Council
On Historic Preservation
[illegible]
Washington, D.C. [illegible]

November 18, 1974

Mr. Cletus J. Gillman
State Conservationist
U.S. Department of Agriculture
Soil Conservation Service
5610 Crawfordsville Road
Suite 220
Indianapolis, Indiana 46224

Dear Mr. Gillman:

This is in response to your request of September 16, 1974, received September 30, 1974, for comments on the environmental statement for the Lye Creek Drain Watershed, Montgomery County, Indiana. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council on Historic Preservation has determined that your draft environmental statement appears adequate regarding our area of expertise and we have no further comment to make.

Should you have any questions or require any additional assistance, please contact Stephen Cochran of the Advisory Council staff at 202-254-3974.

Sincerely yours,

John D. McDermott

John D. McDermott
Director, Office of Review and
Compliance

STATE of INDIANA

INDIANAPOLIS, 46204

DEPARTMENT OF NATURAL RESOURCES
JOSEPH D. CLOUD
DIRECTOR

November 13, 1974

Mr. Cletus J. Gillman
State Conservationist
U. S. Department of Agriculture
Soil Conservation Service
5610 Crawfordsville Road
Suite 2200
Indianapolis, Indiana 46224

Dear Mr. Gillman:

The following are our comments on the Lye Creek Watershed and Environmental Impact Statement.

Environmental Impact Statement

(1) The third paragraph under Section III D-1 (Land Treatment Measures) on page 4 would better read as follows:

Conservation practices to be applied on cropland include contour farming, grassed waterway or outlet, minimum tillage, crop residue use, grade stabilization structure, subsurface drain, and drainage main or lateral. 1/ A combination of two or more practices is often needed to achieve adequate treatment of land. Land treatment practices such as waterways, diversion, pasture planting and management, tree planting critical area planting and rotation from grazing will benefit wildlife. Forestation planting, forest land treatment and forest protection will not only provide enhanced soil protection, but benefit the forest based economy of the surrounding area. The Soil Conservation Service Technical Guide will be used in planning alternatives for adequate land treatment.

(2) The following "project effect" should be added to the list on page 37 under Section V D (Favorable Environmental Effects).

Provide increased soil protection and some benefit to the forest based economy of the surrounding area through: (1) Forestation plantings resulting in a net gain of 12 acres of forest land, (2) management and treatment of 68 acres of forest land, and (3) protection of forest land.

(3) The "Lye Creek Prairie Burn" which lies just south of the watershed is referred to in the April 1969 Montgomery County Comprehensive Plan and should be appropriately mentioned in the final environmental impact statement.

Watershed Work Plan

It is recommended that serious consideration be given to the use of more realistic "n" values to be used in the channel design. Using the dimensions of the channel given in Table 3, the opposite channel bank with brush and trees amount to 20 to 25 percent of the cross section area of the channel required to carry the design flow. Table 3 shows an "n" value of only 0.025 for the as built condition and a value of 0.035 for the aged condition. Under these conditions, it is our judgment that the "n" values used for design and stated in Table 3 are too optimistic.

Table 3 presents "as built" and "aged" data for the proposed channels. It is not clear as to which condition the depth of flow figures in Table 3 and the design water surface profile in Exhibit 6 illustrates.

The Work Plan does not state under which conditions, "as built" or "aged" the economic benefits were determined. We feel that the economic benefits should be determined with the aged condition of the channel and so stated.

The labels at the downstream end of the profile in Exhibit 6 appear to be in error. The label "2 YR. - W.P.EL. 757.88" appears to be the "2 YR. - W.O.P." The label "2 YR. - W.O.P.EL. 757.88" appears to be the "Low Ground." We further note at the same location, the plotting of elevations 757.8 and 757.88 also appear to be in error.

We appreciate the time granted in which to prepare our comments.

Sincerely yours,

William J. Andrews
Deputy Director
Department of Natural Resources

WJA/CCM:ca

CENTRAL
MIDWEST
REPRESENTATIVE

NATIONAL AUDUBON SOCIETY

CENTRAL MIDWEST REGIONAL OFFICE
ROUTE 1, BOX 19 • MAUCKPORT, IN. 47142 • (812) 732-4349

December 26, 1974

Mr. Cletus J. Gillman, State Conservationist
Soil Conservation Service
U.S. Department of Agriculture
Indianapolis, IN 46224

Dear Mr. Gillman:

This letter is in response to your request for comments re: the draft Environmental Impact Statement for the Lye Creek Drain Watershed, Montgomery County, Indiana. I was unable to determine the final date for your acceptance of comments from organizations such as ours but by the time I had written for this EIS, mailed it to the nearest Audubon chapter to the project, and received their comments, nearly a month had passed. Would you please accept this statement from Dr. Robert O. Petty, Associate Professor of Biology at Wabash College, Crawfordsville, Indiana:

> "Enclosed is my reply to the Draft Environmental Impact statement for the Lye Creek Drainage improvement project. All in all, it seems to me to be proposing a much improved type work over those of years past, with new sensitivity shown for effects other than the primary drainage goal. In reviewing this with others of our Biology Department, our initial objection is to any more extensive channelization of natural stream courses and the increased rapidity of run-off which destroys wetland habitat. The work outlined here is focused not on natural water courses per se, but rather on previously channelized segments and older drainage ditches with the exception of a portion of Lye Creek. The deflection weir and fish pool construction method together with one-side-only spoil banking and vegetation preservation on the opposing bank, all suggest a significant improvement in this type project.
>
> "I offer only a few observations. From a natural his-

tory standpoint, a unique aspect of this area is the northern disjunct wet-prairie plant species which occur intermittently and bog species (once native in post-glacial succession, but long gone even before white settlement) which have reinvaded the area from the north following human disturbance (a burn in 1936) and where ever depressions in wet peat were created. A classic area of about 30 acres is located just south of the Durham Ditch (across the section road) on the north edge of sections 34 and 35. This is the Lye Creek Burn area (described by Lindsey et al, Natural Areas in Indiana and Their Preservation, 1969). A field tour of this area recently revealed that the cottonwood, willow, aspen forest which had grown up since 1936 on the edges of the burn area has been cut over extensively, however the rarer herbaceous species and willows persist in the wet depression. (1) This area may well be effected by the deepening of the Durham Ditch even though it lies just outside the designated watershed. I am not sure how much drainage occurs to the north by under-road tiles, etc.

(2) "From a natural history standpoint there exists a unique opportunity within this project to create a small refuge of say 5 to 10 acres ("a Lye Creek Prairie relict area") somewhere along the drainage which cuts through the muck-peat portion of the Durham Ditch segment. It would probably re-vegetate naturally with many rarer wet prairie species. Wabash College Biology students and staff would gladly help in the restoration, transplanting and seeding the small reserve from the surrounding scattered colonies of prairie species. Such a small "natural area" somewhere on easement land would be a unique addition to the overall project and enhance the overall wildlife mitigation concept. (3) As usual, botanical features tend to be ignored in these impact analyses, other than in the most general way as animal habitat, etc. It is clear from the report that the natural floristic wealth of the area was overlooked, nor was possible impact to a recognized significant natural area included in their assessment.

"A suggestion for future projects of this sort should be to extend an invitation to the hearings to the near-

est educational institution. While Depauw, some 50 miles away, was officially notified, as was Ball State University on the other side of the state, Wabash College in whose "back yard" this project exists, was not notified."

Sincerely,

Myron J. Swenson (tma)
Myron J. Swenson
Central Midwest Representative

cc: Charles Moulin
Francis Van Huffel
Charles H. Callison, NAS

MJS/tma